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The Computer as a Household Appliance
In the Subsidized Housing Arena

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Abstract

Across America, the use of the Internet as both a communication medium and a transportation medium is beginning to alter basic perceptions of living. For a select group of individuals—that tend to be well educated, more affluent and technologically savvy—the Internet has provided the choice of un-tethered mobility. For those who have been less socially and economically fortunate, Internet use has had little impact on lifestyle options and opportunities.

The Federal Government, in its belief that the emerging digital economy is a driving force for greater prosperity, began reporting yearly on its citizens' access to technology tools. Their latest 2002 report, *A Nation Online: How Americans Are Expanding Their Use of the Internet*, confirms that the greater the household income and the more highly educated the household members, the higher the incidence of Internet access and use. In recent years, adhoc groups of individuals at all income levels have come together in communities across the country to try to capitalize on the latest technology to better their standard and quality of life. For those in subsidized housing, the challenge has been exceptionally great.

Often the scenario for providing increased Internet access in lower-income or subsidized neighborhoods is one of self-help/volunteerism centered around subsidized learning centers. This paper explores the successes and failures of existing learning center models, and suggests that the computer as a household appliance may prove to provide the greatest potential in providing access to and use of information by those living in subsidized housing.

<u>Introduction</u>

      Leslie Dwight wakes every morning to the sound of cowbells and the bucolic fragrance of the rural fields of Deerfield, Massachusetts. She dons her headset, logs on to her computer, and is instantly at work in downtown Boston from her home-office more than 100 miles away. Sometimes, she even attends meetings and actively participates in lively discussions while gardening in her backyard. Dwight is a systems analyst for a major insurance company, president of a start-up gerontological consulting firm, part-time professor, and homemaker with a husband and two children. A telecommuter for over a decade, Dwight has embraced a new lifestyle made possible only by the use of the Internet as both a communication and transportation medium.

      Today, everyone knows or has heard of someone like this. People who have managed to make the leap into cyberspace. These new workforce pioneers are combining their personal desires with the realities of earning a living by embracing a technology-enabled lifestyle. However, the typical profile of these new telecommuters is alarming—predominantly Caucasian, highly educated, earning incomes well above the national median, and technologically savvy. As a group they are highly mobile and they tend to reshape the communities and environments in which they choose to reside.

      At the other end of the spectrum is Dalia Asuega, a single mother of four living in state-subsidized housing in Honolulu, Hawaii. Like Dwight, Asuega is concerned with the quality of her living environment and providing the best for her family. However, Asuega's concerns include more immediate ones—providing a roof over her family's head, maintaining a steady job, and ensuring that her children will continue to avail themselves of public education opportunities.

      While ownership of a computer and access to the Internet is considered common for the average American household today, it can be a dream for many like Asuega who find themselves in publicly assisted housing. Through government and private sector intervention, this trend has reversed itself somewhat in recent years. While more Americans of all socioeconomic levels have acquired computer skills and gained access to computers and the Internet, it is still the disadvantaged who are most likely to be left behind economically in a digitally enhanced future. The computer and access to the Internet represents more than just ownership of an additional possession. In a technology-intensive and not-too-distant future, where entry-level jobs that previously required no special skills will require the ability to utilize some type of digital terminal, and where access to basic life needs will increasingly be melded with a digital interface, the definition of literacy will include the proficient use of a computer and the Internet. Asuega believes that the ability to use technology, and therefore access to such technology, can improve lives and perhaps even act as a catalyst for both her and her children to one day exit the publicly assisted housing realm. She is not alone in her concerns.

This paper examines the general state of computer and Internet use in the United States, particularly by those who are disadvantaged, and discusses new trends and innovative programs that have emerged in the last few years, which attempt to bridge the technology gap and level the playing field for all Americans. Included in this study are government-initiated, community-based learning centers, connectivity initiatives, and initiatives that attempt to place technology directly into the hands of those that may need it most. And lastly, this paper suggests that the perception of the computer as a household appliance, as ubiquitous and taken for granted as a refrigerator–may provide the greatest potential for ensuring future opportunities and access to information by those living in subsidized housing.

Computer and Internet Use In America

The Federal Government, in its belief that the emerging digital economy is a driving force for greater prosperity, reports biennially on America's access to technology tools. In addition, many public and private organizations across the country now survey and report on how Americans make use of computers and access the Internet.

Since the U.S. Census Bureau began tracking computer use in 1984, when just over 8 percent of the population owned personal computers, computers have proliferated to the point where 56.5 percent of households, or 60.2 million homes, in 2001 included personal computers with 50.5 percent of households, or 53.9 million homes, subscribing to Internet services (refer to Figure 1). This trajectory of use is in keeping with the government's projections made previously in their 2000 report, *Falling Through the Net: Toward Digital Inclusion.* Since then, computer use has increased substantially every year. In the 13 months before September 2001 when the Department of Commerce completed its survey for its most recent survey report, *A Nation Online: How Americans Are Expanding Their Use of the Internet,* published in September 2002, more than 26 million additional people gained access to the Internet. This translates to 174 million individuals, or 65.6 percent of the population, using computers, and 143 million individuals, or 53.9 percent of the population using the Internet.

The Nielson Media Research Corporation, most famous for its television programming ratings, now tracks the use of the Internet by Americans on a weekly basis. This data affords a more current and clearer snapshot of Internet use in America. Nielson's reporting also tracks some 20 other countries as well as the general traffic on the World Wide Web. According to Nielson, in August 2003, the average time spent on the Internet for 126.97 million active Internet-user American households of the 182.14 million households that subscribe to Internet services was 26 hours and 15 minutes per month, a 217

Figure 1: Percent of U.S. Households with a Computer and Internet Connection
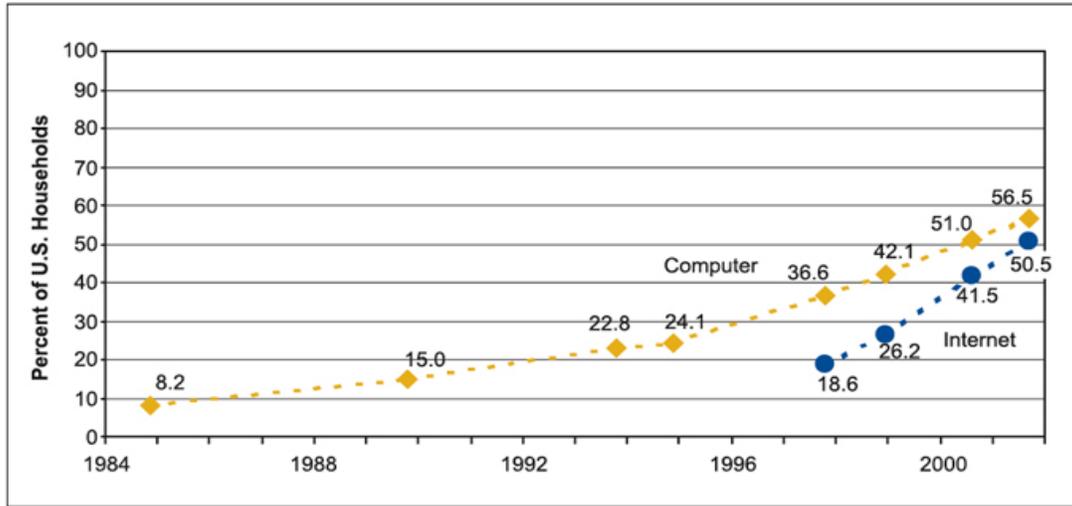
percent increase over October 2002 when Nielson reported the average usage at 12 hours and 6 minutes for 106 million of the 168.5 million users.[1]

Demographic Factors

The latest 2002 report also confirms that not only is computer use throughout America in general on a steep trajectory, but it remains the case that the greater the household income, and the more highly educated the household members, the higher the incidence of computer and Internet access and use (see Figure 2).

To understand the effects of income and education on computer and Internet use, the Federal Government correlates both income and education. The statistics indicate that this relationship is more complex than initially represented. In fact, while the general trend is the greater the household income and education level, the higher the use of computers, these factors act independently when related to computer

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[1] Current Nielson/NetRatings can be obtained at http://pm.netratings.com/npm/owa/NRpublicreports. usagemonthly which can be accessed via the main website, http://nielson-netratings.com. Ratings are based on a sample of households that have access to the Internet and use the following platforms: Windows 95/98/NT and Mac OS8 or higher.

Figure 2: Computer and Internet Use From Any Location by Family Income
Percent of persons Age +3
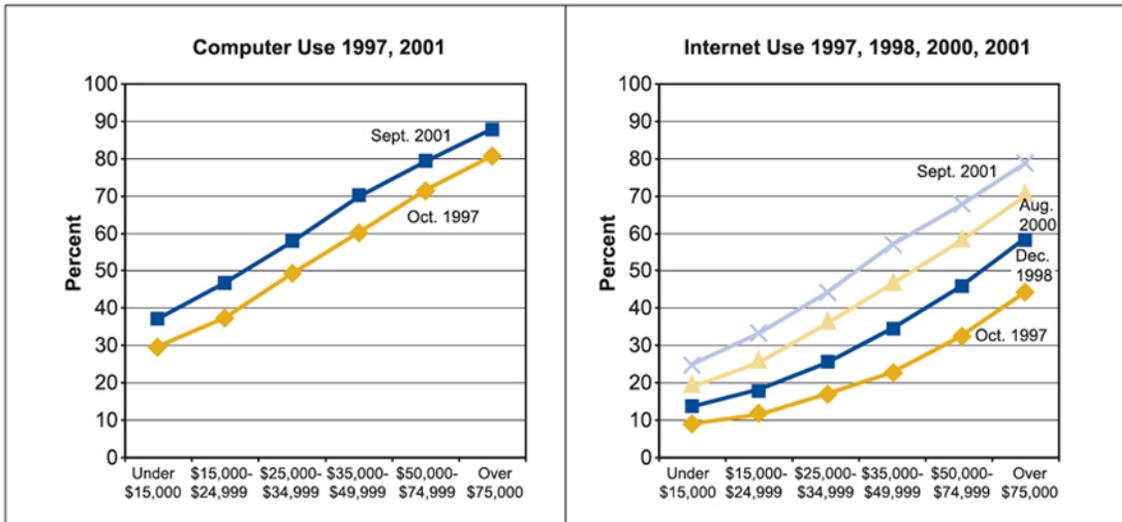
Source of Figure: NTIA and ESA, U.S. Department of Commerce report, "A Nation Online: How Americans Are Expanding their Use of the Internet." February 2002, using U.S. Census Bureau Current Population Survey Supplements. Refer to Page 5 for legend.

and Internet use. People who have lower levels of education, and live within households of high family income, are less likely to be Internet users than those individuals with higher levels of education who live in households with low family incomes. This data also suggest that education may play a more important factor in whether or not an individual is, or has the potential to become a computer and Internet user (refer to Figure 3).

The Government's survey also indicates the trend that Internet and computer use among those individuals living in lower income households has actually increased during the period of this study, August 2000 through September 2001. This accelerated growth rate was not present among households of higher income earners (see Figure 4). For those who were not employed at the time of this study, the trend is similar to that of the lower-income earners, where there was a general increase in use. While the survey indicated growth in all socioeconomic levels, those who were not employed were still less likely to use computers and the Internet.

Across the broader population including those of Hispanic ancestry the differences in computer use still persist. Whites, Asian American and Pacific Islanders remain higher users of personal computers and the Internet than African-Americans and Hispanics (refer to Figure 5). As expected, the older an individual, the less likely they are to avail themselves of the use of either a computer or the Internet. In the 2001 survey 70 percent of the primary workforce (those between the age of 20 to 55) reported that they used computers in the workplace to complete their job assignments.

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Figure 3: Income and Education Have Independent Effects on Internet Use

Age +25
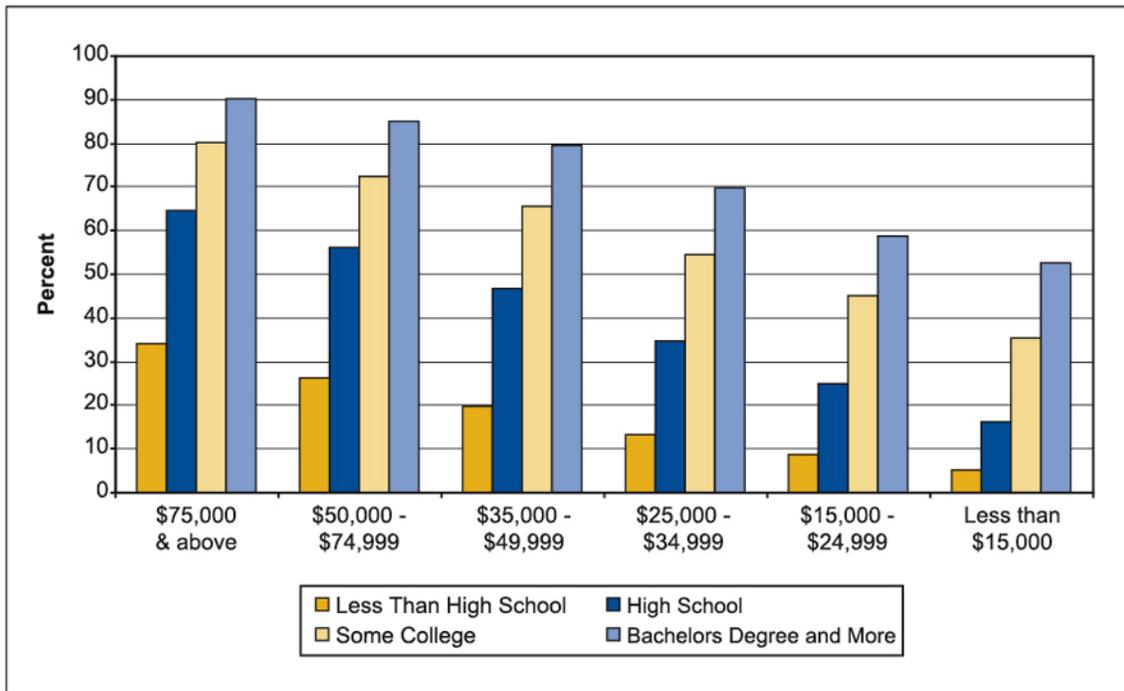
Figure 4: Growth in Internet Use by Family Income

Percent of persons Age +3 (annual Rate)
December 1998 – September 2001
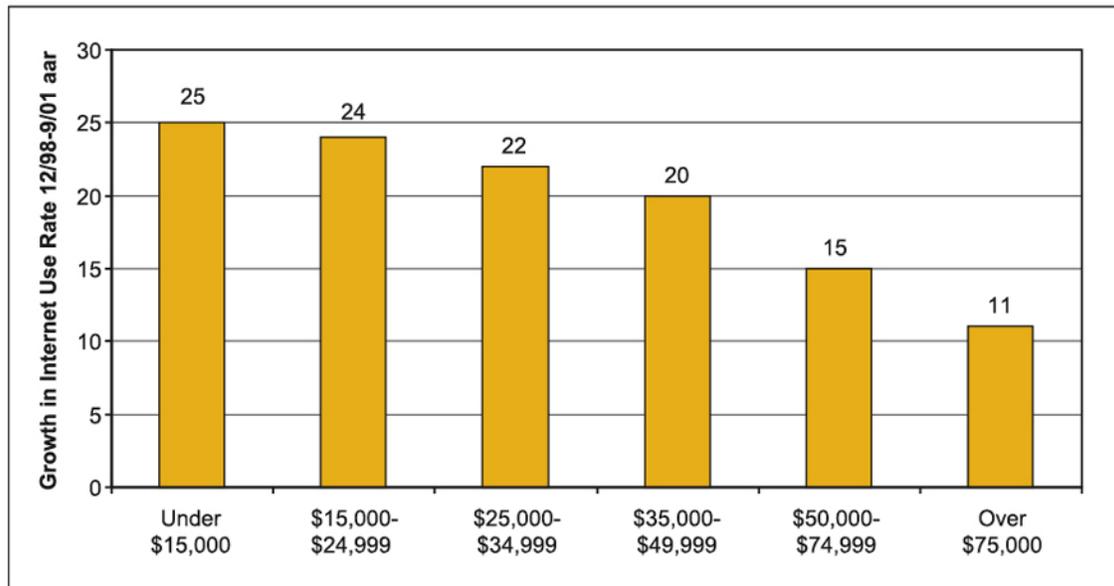
Source of Figures: NTIA and ESA, U.S. Department of Commerce report, "A Nation Online: How Americans Are Expanding their Use of the Internet." February 2002, using U.S. Census Bureau Current Population Survey Supplements.

Figure 5: Internet Use Anywhere by Race/Hispanic origin
Percent of Persons Age +3
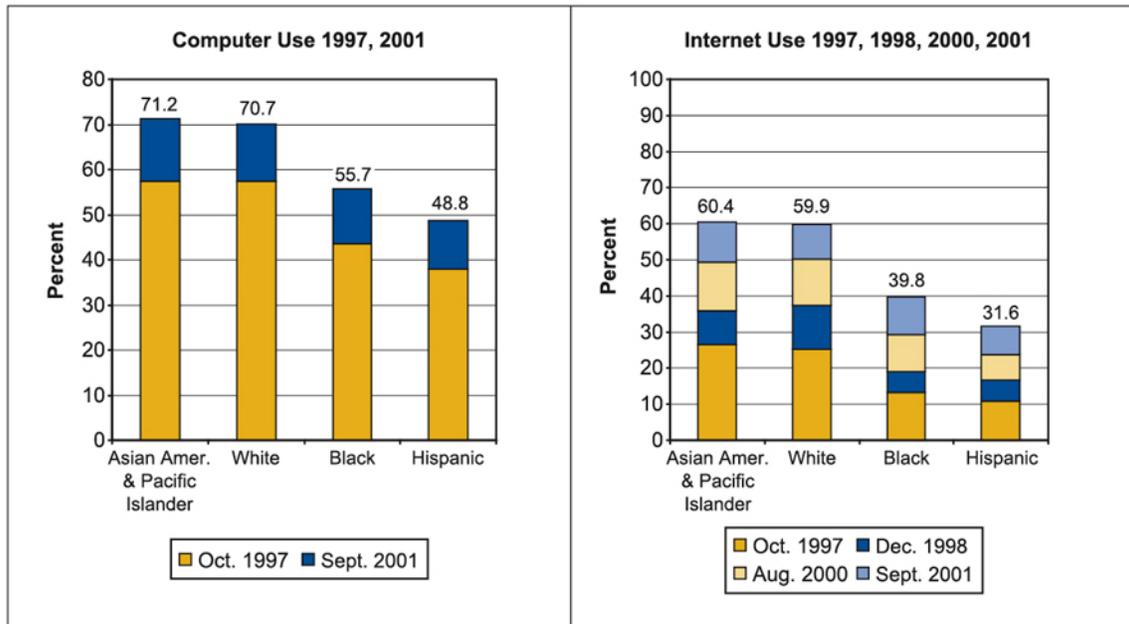
Source of Figures: NTIA and ESA, U.S. Department of Commerce report, "A Nation Online: How Americans Are Expanding their Use of the Internet." February 2002, using U.S. Census Bureau Current Population Survey Supplements.

What do Americans Do Online?

As America's use of the computer and the Internet increases, the concern is beginning to shift from "getting connected" to defining the activities that Americans select while online. In the Government's 2001 survey, nearly half of the population in America used the Internet as a communication tool for email or instant messaging. The top four overall activities beyond email use imply that Americans use the Internet to access information and to be entertained (refer to Figure 6). Of significant interest, is that if the responses were limited to those involved in education pursuits, 75 percent would say they used the Internet to complete educational assignments. A private sector survey, the *American Internet User Survey*, completed in 1995, suggests the longevity of this trend. In this survey, health and medicine were also among the most popular Internet subjects. Nearly 36 percent of all users and 47 percent of female users reported interest in and exploration of these subjects. Other areas of interest were similar to the Federal Government's current survey that listed entertainment, music, parenting/children and lifestyle subjects.

Figure 6: Activities of Individuals Online

Percent of Internet users Age +3

On-Line Education Course — 3.5
Make Phone Calls — 5.2
Trade Stocks, Bonds, Mutual Funds* — 8.8
Job Search* — 16.4
On-Line Banking* — 17.9
Chat Rooms or Listservs — 17.3
View TV/Movies, Listen to Radio — 18.8
Complete School Assignment** — 24.8
Government Services Search* — 30.9
Health Services or Practices Info. Search* — 34.9
Product/Service Purchases — 39.1
Playing Games — 42.1
News, Weather, Sports — 61.8
Product/Service Information Search — 67.3
E-mail — 84.0

Percent

* *These online activities surveyed individuals 15 and over only*
** *This activity was asked of all respondents, if the response was restricted to individuals enrolled in school,*
    the percentage of Internet Users completing school assignments would increase to 77.5 percent.

The study also indicated that more men use the Internet to access information regarding weather, news and sports, whereas women use the Internet mainly to access information on health, services or practices. A larger portion of males use the Internet for entertainment-oriented activities and for financial purposes (i.e. banking online or stock trading). Those 55 or older, while more likely to check on health-related issues, were least likely to use the Internet. Internet users between the age of 25 - 44 were most likely to bank online and shop online.[2]

Recent data, according to Jupitermedia Corporation, which polled 4,341 Americans in September 2002, indicated an overwhelming 93 percent of users accessed the Internet to send and receive email, 79 percent used a search engine, and more than 60 percent used the Internet to research products, services,

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[2] The *American Internet User Survey*, conducted in 1995, surveyed 1,000 random Internet users from a 9.5 million user population. The survey was originally developed by Fulcrum Analytics (formerly Cyber Dialogue), acquired by The Dieringer Research Group (http://www.thedrg.com/) in October, 2002. Statistical information regarding this survey criteria was obtained from the National Center for Supercomputing Applications (NCSA) at http://archive.ncsa.uiuc.edu/edu/trg/survey/j-4.html. Research data obtained from National Science Foundation in its Issue brief, NSF-314 March 31, 2000.

and local information.[3] Furthermore, the online Nielson Netrating reports also indicate that in August 2003, the average American Internet user spent 55 seconds viewing an individual website page and the average surfing session was approximately 33 minutes long.

Work/Home Computer Link

More than 24 million of the 65 million adults who were employed at the time of the Federal Government's survey in September 2001, reported that they also did work at home on a computer. This finding suggests a critical link between the computer in the workplace and a computer at home. While there may be the instance where prolific use of a computer in the home would translate into use of a computer in the office, it is believed that use at work has more of an impact on home use at this point in time. For young Americans who have not entered the work force, the link between adult use of a workplace computer and a computer in the home is amplified.

In June of 2002, the Annie E. Casey Foundation, founded in 1948 to build better futures for disadvantaged American families, released their annual report condensed into a summary entitled *Kids Count Snapshot*. This study, which began in 1990, tracks child welfare in each state across the nation. The Foundation contends that the "digital divide" is robbing millions of poor children of the latest technology and placing them at a disadvantage in education and ultimately in the employment arena. Of primary concern is their ability to compete in a future workforce that is increasingly dependent on computer skill sets. Considering that the US Bureau of Labor's projection for the period 2000-2010 shows that eight out of the ten fastest growing occupations are computer-related punctuates this concern.[4] The Foundation further argues that for the more than 4 million children without access to telephone services, the implications for the divide are even more pronounced.

An argument could be made that access for children beyond the household is sufficient for learning and therefore for future opportunities. However, research by the National Center for Education Statistics as reported in *Kids Count Snapshot*, suggests that "the presence of educational resources in the home that include computers is a strong prediction of academic success in mathematics and science."

Furthermore, researchers for the Minority Student Achievement Network, a national coalition of suburban schools operating in 15 school districts across the country (e.g. Evanston, Illinois; Oak Park, Illinois; Berkeley, California and Cambridge, Massachusetts) surveyed 40,000 of their high school

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[3] Current Internet research can be found at Jupitermedia Corporation's website, go to cyberAtlas: http://cyberatlas.internet.com/
[4] Statistics from *2000-2020 Employment Projections*, by the Bureau of Labor Statistics, US Labor Department, Washington DC as discussed in the *Kids Count Snapshot* by The Annie Casey Foundation http://www.bls.gov/news.release/ecopro.t06.htm.

students for the first time. Founded in February of 1999, this Network was initiated to study the strikingly similar disparity in achievement between white students and minority (mainly black and Hispanic) students. This survey's aim was to try to understand student achievement results from the point of view of the students themselves.

Their findings, released nationally in November 2002, suggest that while minority students are more likely than white or Asian students to think that it is "very important to study hard and get good grades," minority students had fewer resources at home to help them succeed in school. Approximately 57 percent of white students and 42 percent of Asian students said they had more than one computer at home, compared with 20 and 27 percent for Hispanic and black students respectively. Not only are these students at a disadvantage technologically, but they are also more likely to live with only one or neither parent, and their parents are less likely to posses a college degree than the parents of white students.[5]

Cost Factors and the "Off-line" Population

The Federal Government survey indicates that there is a sizable population that is not connected to the Internet. The individuals fall into four main categories:

- Lower-income households, 75 percent of those, which made less than $15,000, and 66.6 percent of those who earned between $15,000 and $35,000.
- Adults with low levels of overall education; 60.2 percent of these adults over the age of 25 had only a high school education, and 87 percent of these adults had less than a high school education.
- Hispanics, 68.4 percent of all Hispanics and 85.9 percent of Hispanic households where only Spanish is spoken.
- 60.2 percent of all blacks.

One factor common to this large group of non-users is cost. The Government's survey asked those without Internet subscriptions to identify the main reason and 25 percent–and most often the lower-income households–responded that cost was a factor. Figure 7 indicates the inverse correlation between income and cost.

Literacy Redefined in the 21st Century

The need for young individuals not yet in the workforce to be computer and Internet literate becomes even more apparent when discussing the future. In March of 2002, AOL Time Warner Foundation and the Bertelsmann Foundation, two of the world's premiere media conglomerates, came

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[5] Information on the Minority Student Achievement network can be found on their website, go to http://www.msanetwork.org/.

Figure 7: Adoption Rate and Internet Cost by Income
Percent of U.S. Households without Internet
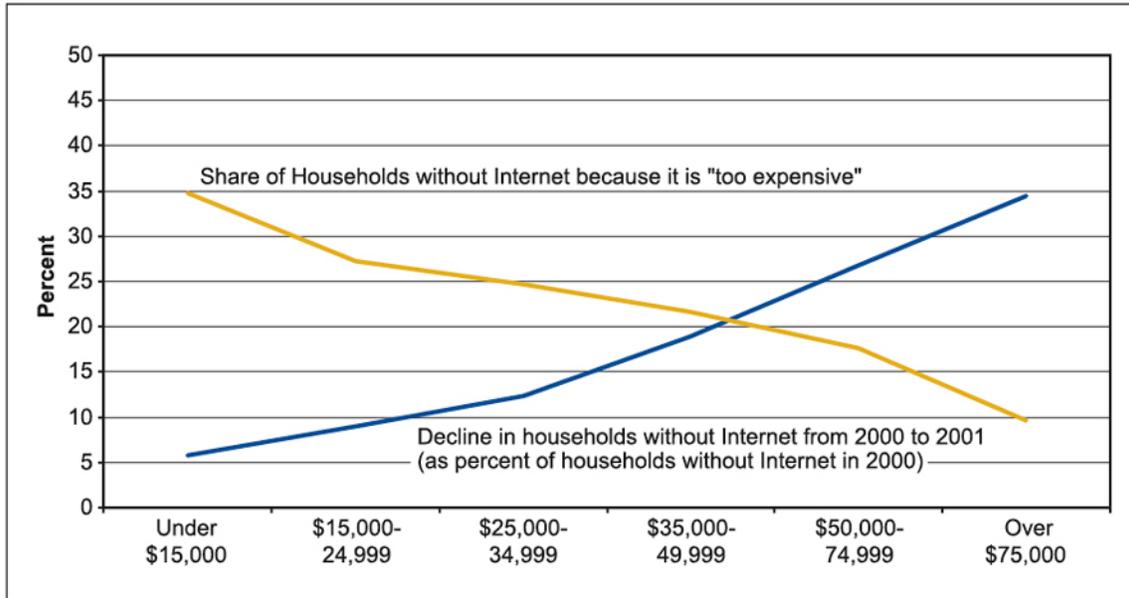
together in Berlin, Germany, with other international educators, business interests, and governments to hold a summit on what they entitled, *21st Century Literacy*. Their goal was to begin the dialog on the impact of the converging media world and to help identify new standards for what literacy might mean in the near future. Their findings, summarized in a paper, concluded that reading and writing would be insufficient skills for today's children in tomorrow's world. In tomorrow's world, literacy will mean "the ability to use new media such as the Internet to effectively access and communicate information." Information literacy will mean the ability to gather information through these new media platforms and organize, filter, evaluate and then form valid opinions." Conversely, for those in the media industry, media literacy will be defined as an ability to effectively distribute content to audiences of varying sizes and socioeconomic backgrounds as each individual's capacity increases through the use of new technology.

In a short CNN article written in January of 2000, *The House of the Future is Here Today*, David George explored existing technologies already in use that have the perceived potential to become part of the future of mainstream America. He writes of Bill Gates' residence and the CD-ROM which accompanied his 1995 book about the future, *The Road Ahead*. Two years later, many of these computer-driven features are now readily available to be purchased in consumer-like fashion, such as lights that automatically turn on when a resident arrives at home, speakers hidden beneath wallpaper, touch pads that

activate many electronic household appliances and computer regulated water temperature or air temperature in each room. In 1999 Electrolux previewed their first Internet Refrigerator, "Screenfridge," and LG Electronics, a Korea-based appliance manufacturer advertises its version, a titanium finished refrigerator with a 160-degree viewable LCD door mounted monitor with high fidelity speakers. In addition to Internet access, the LG Internet Refrigerator is delivered with preloaded MP3 music capabilities, a daily diary and scheduler, and photo album. In other real life prototypes, such as in the Watford suburb of London, a British residence contains built-in video conferencing, TVs that double as Internet connections, a kitchen computer that tracks what is in the refrigerator, and a system that will allow a coffee pot to be operated remotely. Naturally, all of this household wizardry can be accessed from anywhere in the world at any time via the Internet.

On a level of more immediacy, Legon Jeordan writes in an October 2002 CNN article, *Lady Justice Goes Digital*, about email traffic tickets, which can be appealed via the Internet in Yakima, Washington. While Eric Schlosser, the author of the best-seller book *Fast Food Nation*, argues that computer terminal interfaces are being made simpler–mainly through the use of pictograms–to accommodate part-time, teenage, immigrant, elderly and other marginalized workers, there is still a strong argument that the breadth of life's daily activities affected by the use of computers and access to the Internet is widening and the pace at which those who lack technology literacy are being left behind is only quickening (Schlosser 70-72).

Community-Based Technology Access

Since the 1980s, when the for-profit housing production of affordable rental housing and affordable for-sale housing stock in America dropped off in the face of reduced direct government subsidies, nonprofit entities have stepped in to fill some of the void. In the last 15 years these organizations in association with for-profit private sector enterprises have met the challenge head on with varying degrees of success. The most well known, include the community development corporations (CDCs), mutual housing associations (MHAs) and some larger tenant-based groups around the country (Hecht and Stockard 1-2; Keyes 201-202). The National Congress for Community Economic Development (NCCED), the trade association for many of these community-based development corporations which currently serves over 3,600 CDCs across the nation, reported in their 1995 report *Tying It All Together* that their industry was responsible for developing more than 400,000 units of affordable housing (Pitcoff).

As CDCs and other community-based development corporations and organizations have matured, the emphasis has begun to swing away from just providing "bricks and sticks" to also providing social services and nurturing economic development. As community development-based corporations began to

expand their scope of services a new group of intermediaries emerged to fill the need between these agencies, their funding sources, and the residents they serve (Glickman 497-498).

While computer use in the public housing sector by community-based development corporations and their intermediaries is not new, most efforts for many years have been focused on streamlining the management and operational aspects of organizations such that services can be delivered in a timely and efficient manner. Visual Homes, a division of Information Systems & Services, Inc. (ISSI) since 1986, has provided user interfaces such as wait lists, utility tracking systems, work orders and rent comparisons. Another company offering similar services is Modern Software Technology Inc., the developers of the Public Housing Authority Software. Arguably the largest is Emphasys Computer Solutions with more than 85 employees, servicing over 250 Housing Authorities nationwide.[6]

The Community-Based Learning Center Model

A few years ago, Asuega led her community-based tenant association's efforts to take matters into their own hands and helped create their version of a learning center with the support of individual community volunteers and the support of a partnership between the Manoa Campus of the University of Hawaii, the Leeward Community College, the Kapiolani Community College, and the Technology Learning Center (TLC), a nonprofit self-help organization. Together, they applied for and received a five-year, $40,000 annual WorldCom grant.

Once a year, representatives from each of the twenty communities sponsored by the TLC come together at Brown University to share ideas and network. Even before receiving the WorldCom grant, Asuega believed in the importance of computer skills to improve lives. She began her version of the Technology Learning Center in a single room with eight donated computers. Through fundraising efforts, the center was able to purchase a few more computers and together with the donated computers, they created a non-intimidating computer-training environment for the children. Today, all age groups visit and are welcome. Ipa, their youngest student, was just three years old when she began attending the TLC.

The idea of the Computer Learning Center is also not new. Arguably the most successful grouping of these centers–Neighborhood Networks (NN)–was begun as a Federal Government initiative in 1995 by the Department of Housing and Urban Development (HUD). Neighborhood Networks established multi-service community learning centers across the country that could bring "computer access and lifelong learning to residents of HUD insured and assisted housing." The first Neighborhood

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[6] Additional Information about Information Systems & Services, Inc. (ISSI) can be found at http://www.VisualHOMES.net/solutions.html. To read more about Modern Software Technology Inc., go to http://www.phasnet.com/ and more information on Emphasys Computer Solutions can be found at http://www.emphasysworld.com/overview.htm.

Networks Center was initiated at Edgewood Terrace in Washington, D.C., as part of a public/private redevelopment project for 800 housing units in a low-income housing community.

Today, more than 1,100 Neighborhood Networks Centers operate across the country, in Puerto Rico and the Virgin Islands in HUD multi-family housing properties. Approximately 60 HUD NN Coordinators, located in HUD field offices, volunteer to implement the program. The aim of each center is to provide for the specific needs of each community. Accordingly, the profile of each center is varied, from three donated computers in a designated area used for other purposes, to a 40,000 square foot learning center with an annual operating budget of about $2.2 million dollars, such as the center at Edgewood Terrace. These centers act as a bridge offering access via the Internet to "job opportunities, social services, micro-enterprise possibilities, and educational programs."[7] Delores Pruden, director of Multifamily Neighborhood Networks, points out that the goal of Neighborhood Networks, "is to provide access to technology for the purposes of job training and placement, educational advancement, and, in general, to improve the quality of life of residents in HUD assisted and insured properties."

Another nonprofit organization is CTCNet, founded in 1990 as the Play to Win Network by Antonia Stone. Stone was a public school teacher who began with a single computer technology center in her Harlem basement in 1983. She has left as a legacy a national organization that is now supported by a yearly grant from the National Science Foundation. Today, there are over 1,000 technology centers in low-income communities that offer access to computers and computer-related technology.

More importantly, CTCNet, which maintains National Science Foundation support, examines its impact on communities and individuals. Their general findings are published in two documents *Community Technology Centers: Impact on Individual Participants and Their Communities* and *Impact of CTCNet Affiliates: Findings from a National Survey of Users of Community Technology Centers,* published in April 1997 and June 1998 respectively. These documents suggest that community technology centers provide an important and comfortable place where disadvantaged individuals can learn new technology skills–skill sets that can improve their job qualifications in a place that fosters a "sense of community and personal effectiveness."[8]

In addition, there is a host of other quasi-public/private ventures that attempt to stretch public and private resources while providing access for the underserved. The 21st CCLC Program is a key component of President Bush's 'No Child Left Behind Act,' providing an opportunity for students and

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[7] Additional Information on Neighborhood Networks initiatives and information on the Minority Student Achievement Network can be found at http://www.hud.gov/offices/hsg/mfh/nnw/nnwaboutnn.cfm.

[8] For more information on The Education Development Center, Inc. and the Center For Children & Technology, go to http://www2.edc.org/CCT. See also the U.S. Department of Education's website for links to reports at http://www.ed.gov/offices/OVAE/AdultEd/CTC/ctclinks.html.

their families in low performing schools to continue to learn after the school day has ended. Congress appropriated $1 billion for after-school programs in 2002. Educational activities offered by these programs are geared to assisting students with meeting or exceeding local and state academic standards. In addition, 21st CCLC programs provide "youth development activities, drug and violence prevention programs, technology education programs, art, music and recreation programs, counseling, and character education to enhance the academic component of the program." The program includes approximately 6,800 rural and inner-city public schools in 1,420 communities as active participants.

Another grant-based program is the Community Technology Centers Grants sponsored by the Department of Education (DOE). The purpose of this program, like others of its kind, is to create or expand community technology centers that will provide disadvantaged residents of economically distressed urban and rural communities with access to information technology and related training. The DOE received more than 970 applications from across the country last year and awarded 56 grants to 24 States, totaling nearly $15 million.

On September 27, 2002, the Commerce Department's National Telecommunications and Information Administration (NTIA) announced the award of $12.4 million in Technology Opportunities Program (TOP) grants to 25 nonprofit organizations from the 741 applications they received. TOP grants, matched by $13.6 million in contributions from the private sector as well as state and local organizations, demonstrate how information technology can address public concerns over areas such as housing, safety, economic development, and e-government.[9]

Not all initiatives have been government sponsored. The Massachusetts Institute of Technology (MIT) Media Lab serves youths aged 10 -18 from different communities in Boston and other underserved neighborhoods in the area. The Intel Computer Clubhouse was originally founded in 1993 by the Computer Museum (now a part of the Museum of Science in Boston, Massachusetts). In partnership with Intel, the award-winning Clubhouse model is on its way to becoming a network of 100 facilities in underserved communities around the world. As of the Summer of 2002, 66 Clubhouses had been funded. The success of the Intel Computer Clubhouse has been measured in two studies commissioned by Intel through The Center For Children & Technology of the Education Development Center, Inc. based in New York City. The Center's role, based on a 20-year history, is an investigative one that studies technology as a vehicle for improving teaching and learning methods inside and outside of the classroom. In the Center's second year of study their findings were published in the report, *Evaluation of The Intel Computer Clubhouse Network, Year 2 Report*. The emphasis of the report was to gauge how Clubhouse

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[9] For more information on the 21st CCLC programs, CTC grants and the TOP grants, visit http://www.ed.gov/offices/OESE/21stcclc/index.html, http://www.ed.gov/offices/OVAE/AdultEd/CTC and http://www.ntia.doc.gov/otiahome/TOP/.

members' individual progress matched the goals of the Clubhouse programs and which factors helped facilitate this progress. A successful Clubhouse environment was described as an environment for youths aged 10 - 19 collaborating with adult mentors to improve the youths' abilities to: express themselves using technology; collaborate as team members; deal with complex issues effectively; successfully plan and execute complex projects; and foster self-esteem and self-efficiency. "Technology fluency" is the main objective of the Clubhouse model. Through one-on-one interviews with a sampling of Clubhouse members, the study concluded that overall, "the children in the study developed basic literacy with word processing, email, and the Web." Those who spent more time online developed more "robust skills in online communicating and authoring."

How Effective Are Community-Based Learning Center Models?

Adopting the learning center model has become a popular vehicle by which communities introduce technology into the affordable housing arena because of its facilitator or intermediary-like approach that brings public and private efforts together with community volunteerism. However, very little data has been collected and analyzed as to the success or failure of these centers.

In April of 2000, a qualitative study funded by the National Science Foundation interviewed twelve users of Community Technology Centers (CTCNet) to try to determine the impact on a participant's quality of life and learning opportunities. This report was the third in a series of reports. The first report, completed in 1997, was based on interviews of 131 people at five CTCNets. The findings suggested that these centers affected participant lives positively in eight major areas: job skills and access to employment opportunities, education and outlook on learning, individual technology goals, academic skills and knowledge, personal efficiency, use of time and resources, civic participation and social and community skills. The second report completed in 1998 surveyed 814 individuals at 44 community centers. The outcome of this survey reinforced the original findings of the 1997 report. The 2000 study confirmed that CTCNets enabled economically disadvantaged individuals to do the same things that more fortunate individuals could do, such as send and receive email, prepare resumes, search the Internet, and play online games. The low-pressure approach to user-centered support made the difference between success and failure, especially among those with lesser skills and education.

In 1999, HUD commissioned a comprehensive study that was intended to provide "general insights into the types of interventions, client usage, client expectations, the number and types of opportunities created by NNCs, the steps taken by clients throughout the process, and initial outcomes as well as experiences over time" (Office of Policy Development and Research i). For those centers in operation for at least three years, 21 of 41 centers in nine properties across the nation responded. The survey found that these centers operated 42 hours a week on average and more than half offered access to

the Internet. The average center received $177,356 in combined HUD and non-HUD funding, with donations of equipment and time being the greatest non-HUD funding source. On average, 44 percent of users were between 18 and 61 years old, and 42 percent were under age 18. In these centers, 69 percent were black. Computer classes were most commonly offered (30 of 41 centers) as well as job training programs (22 of 41). Of the 41 centers surveyed, 22 reported at least one resident found employment in the year after participating in the center's programs. Of the 22 centers, all reported that at least some of their participants found full-time positions. The majority of the centers responded that they saw positive change to the community-at-large in the areas of general building safety, the residents' treatment of the property, and the overall cleanliness of the property (ICF ii).

CommonBond, Minnesota's largest nonprofit developer and manager of about 3,000 affordable housing units, also released a report in 2001 for HUD that surveyed 4 of its 13 multi-family properties with more than 600 residents. They found that of the residents who participated in their Career Advantage Program, 39 percent increased their income from employment compared with only 25 percent of non-participant residents. Participants experienced a greater decrease in public assistance receipts than did non-participants, and 18 percent of participants moved off public assistance compared to 7 percent of non-participants during the same period of time (CommonBond). Self-reporting profiles of the individual Neighborhood Networks Centers and the communities they serve can be accessed directly via the Federal Government's website.[10] An analysis of the raw data, voluntarily supplied by 1,386 centers indicated that 1,162 were operational as of January 2003. Those who had reported information on their center confirm that most centers are small, and while the report format was not uniform, most reported serving less than 600 visits or less than 600 individuals that visited. The data indicated that the services each center provides are also diverse. For those who reported on the focus of their center, 34 percent indicated that they provide services to seniors, 30 percent to adult education, and 7 percent to youth education (refer to Figure 8).

Critics of the Learning Center model, such as Eric Cohen, suggest that for every anecdotal technology-success, "the excitement of the students, the effective use of computer games to teach math, the digital cameras that make students into mini-documentary makers–there are anecdotes that give ample cause for skepticism. Indeed, every time we saw kids, the most popular sites were video games and music videos." Cohen is a fellow at the New America Foundation who teaches at the Beacon House, one of the technology outreach centers at Edgewood Terrace. Most programs at the learning centers are geared towards the premise that learning should be fun and that computers represent opportunity. In contrast to the upbeat premise of empowering residents to become economically independent is the reality that most

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10   For more information on the individual Neighborhood Networks Centers, visit http://www-domino4.hud.gov/NN/contacts.nsf/WebDatabaseSearch.

Figure 8: Neighborhood Networks Centers
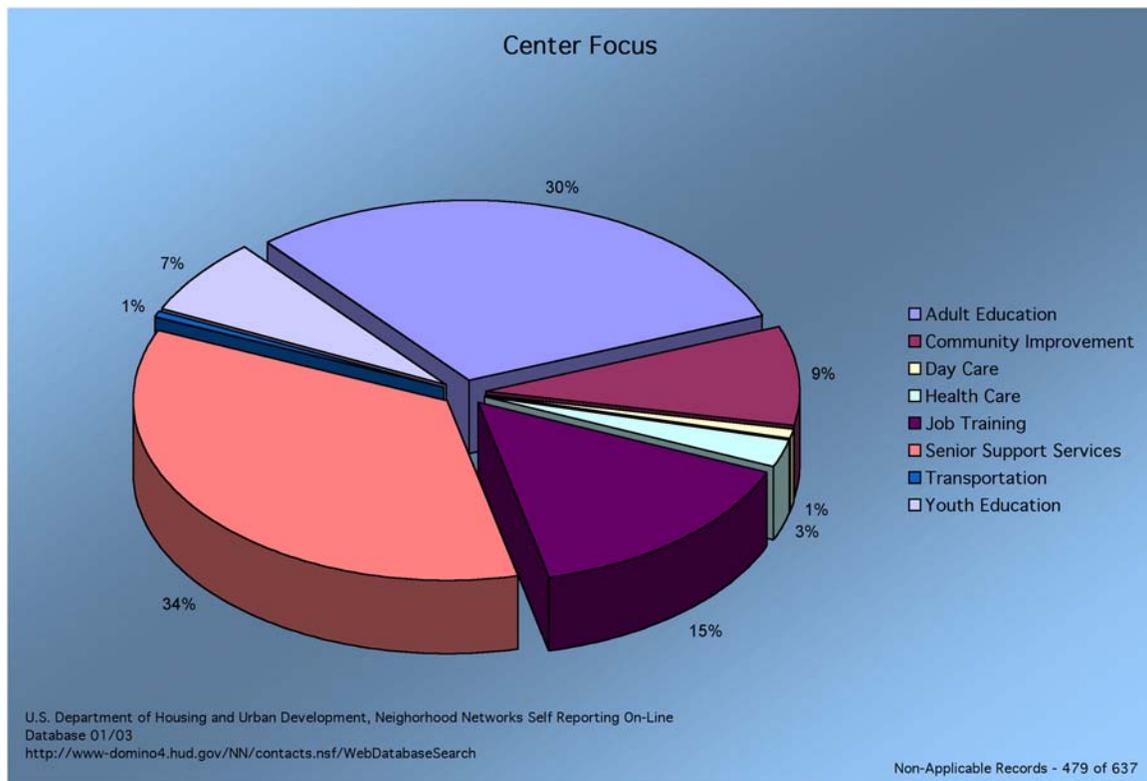
Raw data provided by Neighborhood Networks in January 2003 as reported by each individual center at the time. A limited analysis is contained in this paper.

of lower-income housing students Cohen writes of have no full-time fathers and can barely even read. He wonders if computers are actually helping students to learn to read (Cohen).

Although Neighborhood Networks does not currently track the centers that cease to operate, or the rationale behind their closure, Delores Pruden and Charles Famuliner (past Neighborhood Networks director) both point out that the success of an individual center depends not only on strong residential participation but also on financial support from the community. They cite one or the other as being the major reason, in their experience, for center closure.

Resident-Based Technology Deployment

In recent years, a new breed of nonprofit and intermediary organizations has emerged to fill a perceived void between housing agencies and authorities and the specific needs of the residents that they are entrusted with serving. These organizations point out that community-based development organizations have focused billions of dollars mainly on rebuilding a community's physical plant and its "institutions" or "capacity" in the form of traditional maintenance programs. When compared to the

billions spent on construction, very little has been spent on programmatic development that invests directly in assisting the residents to help themselves towards a better economic future (Glickman 50; Hecht, The 21 Century 1).

The Beehive Project

One Economy Corporation, with its innovative Beehive Project, is one such company running counter to the trend. In a joint paper titled "The 21st Century's Most Successful Communities: Technology-led Ecosystems & Citizen Empowerment," delivered to the National Community Development Association in November 2002, Ben Hecht, president of One Economy Corporation, emphasizes that its efforts are about, "change[ing] fundamental relationships that have existed for decades between low-income people, the people and organizations that serve them and the economic mainstream." Rather than concentrating on efficient management systems, or the physical well-being of residents and the facilities that house them, their attention is focused on providing access to technology, access to information, and access to a host of tools that will enable residents to "improve their lives."

According to Hecht, the Beehive Project was begun just a year ago on the principle that "a complex web of relationships, networks, products and services" that involve participation on the part of both the public and private sectors needs to be developed such that people are integrated into mainstream society "with dignity." Hecht also believes that it is the duty of these agencies to help "build an individual's capacity or one's ability and will to act on one's behalf." Hecht's vision is a "technology-led ecosystem," that integrates and provides, in network fashion, access to a wealth of information that can be added to exponentially. He believes that in the past, there was no effective and cost-efficient way to create such an open-ended support system. By engineering support networks at the residential level, at the agency level, and at the technology level, they believe that they can make a difference.

The core of the Beehive Project is an interactive web-based information and educational interface point called The Beehive (refer to Figure 9). The Beehive is meant to be "comprehensible and scalable, aggregating content, products, services from the private and public sectors in one place," that residents require to improve their "quality of life and build wealth." It is meant to be available to anyone at any time regardless of "income, race, or place" in a user-friendly manner. The interface is to be personalized, meaning lower-income households should be able to focus on issues that matter most to them and filter out that which is irrelevant. The information accessed should be "localized," such that products and services can be offered both at a national level and local level when appropriate. And lastly, the Beehive
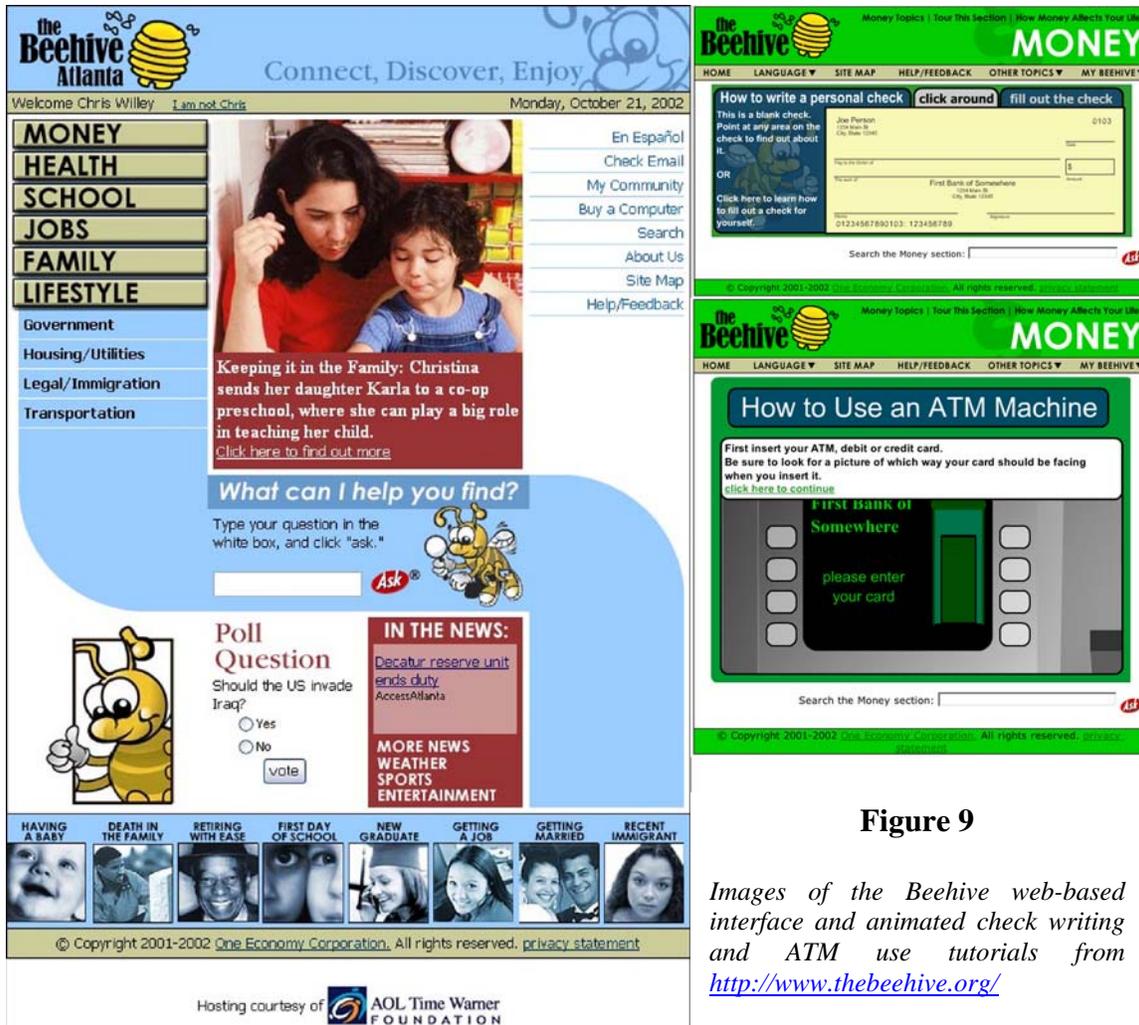
Figure 9

Images of the Beehive web-based interface and animated check writing and ATM use tutorials from <http://www.thebeehive.org/>

should be a "force for civic engagement." Given access to information, technology, and a means of digital communication (email), a lower-income resident can have an impact on local, state and national issues, both individually and as a collective group.

The Beehive website was developed through extensive focus group research and provides an opportunity for individuals to access information they deem necessary to improve or enhance their quality of life. In keeping with the developers' mission, The Beehive aims to accommodate people with different languages, skill levels and interests, and even make it easy for them to have their voices heard in their community. Thus, the website not only can be viewed in multiple languages, but residents can answer simple polling questions and participate in chat-like discussions. The site is also tailored to meet the specific needs of each community served and is even named differently as a resident selects a geographical location when entering personal data. Currently the Beehive serves 8 major cities with 11 more slated to be online in the coming months.

The Beehive website is augmented with training classes usually offered in association with many pre-existing, local technology training centers. Some of the features the site offers include interactive and easy-to-use tutorials on check writing, ATM use, writing a simple resume, locating local job listings, viewing income tax form directions, filing an income tax return, obtaining government and immigration information, accessing housing and utility information, and managing lifestyle and money matters – in short any information that a resident in a lower-income environment would require for daily life and an educational supplement to allow each individual to take their next step.

One of the first "technology led-ecosystems" was developed at Camfield Estates, a low-to-moderate-income housing development located in the Roxbury/SouthEnd district of Boston, Massachusetts. This project is a partnership between the Camfield Tenants Association (CTA) and the Massachusetts Institute of Technology, which formed the Camfield Estates-MIT Creating Community Connections Project. Initiated in 1999, the project has as one of its goals to become a model for individual, family and community use of information and communication technology to enhance their lives and the lives of others in housing developments across the country.

A community-based network was established to bring desktop computers, software, and high-speed Internet access into the homes of every family that desired it. A community technology center located on the premises in the community center offered courses to participating families. The community content was delivered through a community-based website called Creating Community Connections (C3). The C3 website was developed by MIT researchers and the Camfield residents specifically to connect the residents to local associations, public institutions, and neighborhood businesses. It is the precursor to One Economy's "national technology led-ecosystem," the Beehive (refer to Figure 10).

Figure 10 - Images of the Creating Community Connections (C3) website.
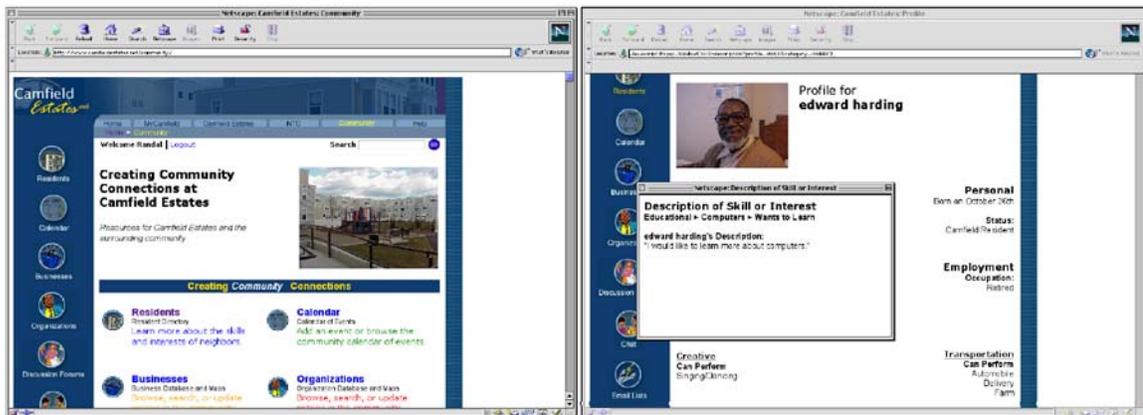
Developed by MIT-researchers.   Reprinted from The 21st Century's Most Successful Communities: Technology-Led Ecosystems & Citizen Empowerment by Ben Hecht and Randal Pinkett, Ph.D., 2002.

Since the inception of the C3 network, Camfield residents have been proactive in a multitude of activities enhanced by the implementation of this technology-based system; resident-to-resident community issues are discussed, asset-mapping of local resources within a 1.5 mile radius has been established, skill-mapping of resident interests and abilities have been developed, comprehensive technology courses are offered, resident-led technology and community building initiatives have been started, and resident-to-resident evaluations of the project have been constructed.

According to the project developers, early results indicate that the project, while successful, holds promise for a larger community as well. The Camfield residents have reinforced and expanded their local ties, they are more aware of and utilize local community resources, they are better informed, and many are inspired to stay informed, about local, state and national issues. The residents are using the Internet to gather information to address basic needs, and many have cultivated a renewed confidence in themselves and their ability to learn (Hecht, 21st Century 2-5).[11] Beyond a quantitative study, perhaps the proof of the Beehive's success lies in its rapid adoption and growth from its inception a year ago as well as the increase in the number of users who access it on a daily basis. In October 2002, according to Hecht, the Beehive site received over 1.5 million "hits," or visits, in a single month.

Rainbow Terrace IEvillage and the Kerry Company

The 484-unit Rainbow Terrace, once the largest and considered to be one of the most dangerous communities in Cleveland, Ohio, will soon be a model for other housing complexes. In October of 2000, Arthur Greenblatt of Vesta Corporation, a Connecticut based private development company, announced plans for a $50 million renovation of the apartments that, when complete, will extend beyond the simple "bricks and mortar" into state-of-the-art technology that provides access to education, child care facilities and services for all residents.

During the selection process, Vesta Corporation offered not only a Neighborhood Learning Center, but two additional items: "funding to form a strong residents' association, and the offer to each resident of a computer of their own." The rationale, Greenblatt says, is that, "we felt computers were important for kids and it was an attempt on our part to figure a way to put kids sort of on a level playing field with other families that might be able to afford computers in the home for their kids."

Vesta invested $3,256,000 in debt and equity for the construction and outfitting of the Learning Center, Day Care Center, the IEvillage web application and the first 40 resident computers. Vesta Corporation, Cuyahoga Community College, Cleveland's Municipal School System and The Kerry Company secured a $550,000 21st Century Learning Center grant from the State of Ohio's Department of

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[11] For more information on The Beehive project go to http://www.thebeehive.org/ and to One Economy Corporation at http://www.one-economy.com/.

Education. These funds will pay for the teachers at the Learning Center for the next five years. Cuyahoga Community College staffs the Learning Center and also uses the Learning Center as a laboratory to instruct their students, bringing education to the doorstep of those that need it most. As Jack Kerry says, Tiffany Barnes, the District Director of the Community College, "views Rainbow as a new, 1,000 person campus."

Recognizing that Vesta knew very little about how to put its idea into reality, it retained The Kerry Company (TKC). TKC provided the technical assistance for each of the four elements of the IEvillage: high speed internet and a computer in each unit, a Learning Center, partnerships with community, government, and education groups and a web application that links all of the partners.

After a training session, the Rainbow Terrace website advertises that each family will receive a computer along with uninterrupted high speed Internet access. A visitor to Rainbow Terrace's website, www.rainbowterrace.com, can sense immediately the innovation and change. The site, which links with Beehive, gives all of the IEvillage partners, especially the residents, the best online education content and easy to use management tools for communicating with each other online and tracking Learning Center participation.

One element of the web application, the *IEvillage* education sites, is a network of 250 educational sites and a strong association of website portals for students of all ages that come together in one unified delivery system under the direction of the Kerry Company, led by president and founder Jack Kerry. The websites featured by *IEvillage* are not selected randomly. The top 50 websites are recommended by the United States Department of Education, the Encyclopedia Britannica, the Smithsonian Institute and other national rating organizations. The target audience is wide, from kindergartners to college students.

The heart of the *IEvillage* is a newly developed interface called *My Bookbag* (refer to Figure 11). My Bookbag acts as a clearinghouse, which allows a user to create a collection of favorite educational sites. Users can organize their personal interests into categories and groups that make sense to them.[12] As Kerry says, "the idea of *IEvillage* is to take the technology and use it as a tool."

The *IEvillage* website was launched in December 2002 with the opening of the Learning Center. Attendance averages 150 students a month. Employees from Cuyahoga Community College's Technology and Information Literacy Initiative (TILI) staff the Learning Center. TILI, a citywide project created and developed by L. Tiffany Barnes, deals directly with bridging extant technology gaps in underserved communities, and stresses the importance of teaching and practicing good information literacy behaviors on all academic levels. Working directly with the Cleveland Municipal School District

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[12] For more information on the Rainbow Terrace IEvillage go to their websites at http://www.rainbowterrace.com, http://www.Vestacorp.com, and http://www.kerryco.com.

(CMSD), Cuyahoga Community College developed a Learning Center curriculum that teaches directly to the CMSD curriculum and targets grade improvement and an increased pass rate on the State Proficiency Examination. Students have the opportunity to attend classes at the Learning Center six days per week, and classes began in December 2002. When comparing student grades (as of December 2002 to those grades recorded in June 2003), students from Grades 1-5 have shown marked increases of at least one letter grade in the subject areas of Mathematics (43.5%), Reading (44.9%), and Science (48.6%). Dr. Alex Johnson, President of Cuyahoga Community College's Metropolitan Campus, notes that, "TILI programming provides the support that all students need to succeed. Students need to develop quality information literacy skills buttressed with high-level technology skills in order to be successful in all academic arenas."[13]

A quick browse through the website and one can view the work of the students who have been to the learning center, their attendance records, how long they worked, samples of their work, and a self-generated report tracking system of suggestions. Both Kerry and Greenblatt are realists. They recognize that there may be some vandalism and perhaps some theft, but they view the computer as another fixture in the apartment that requires maintenance and service. Their plan, regardless of security concerns is to buy new computers. Greenblatt points out, "given the choice of buying used, refurbished computers, or someone walking into your apartment with sealed boxes from Gateway, Dell, Compaq or IBM computers, which would you prefer?" The plan is to also buy services rather than just hardware and to replace obsolete computers using reserve funds instead of treating the computer as a one-time purchase. Because "the apartments are not as large as we would like them and we're concerned about space constraints,"

Figure 11 – *The Rainbow Terrace homepage from http://www.rainbowterrace.com (left) and the IEvillage home page from http://www.Ievillage.com/ (below).*

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[13] Data from "Ievillage Tracking System and Cleveland Municipal School System."

Greenblatt notes, "each will also come with a flat screen monitor, and hopefully, the residents will use them, use them well, and they will end up with options and choices."

Vesta and Kerry are currently working on five other Learning Centers and IEvillages at other Vesta properties modeled after Rainbow Terrace. Vesta sees this as a must for all of its properties. When asked how Vesta can afford to build these Learning Centers and provide the families with computers, Greenblatt's response is, "How can we afford not to?"

The computer in the Home and Just-In-Time Information Access

In February of 2002, the Center For Children & Technology, who evaluated the Intel Clubhouse model, also released its findings on the impact of computers in the home environment. Their report, entitled *Children's Emerging Digital Literacies: Investigating Home Computing In Low- and Middle-Income Families*, studied nine low-income and ten middle-income suburban children of diverse backgrounds with an Internet-enabled home computer.

Their study found that all of these children used their computer to complete schoolwork. Those with leisure time spent on average two to three hours a day communicating with their peers, playing games, and pursuing creative hobbies on the computer. All children in this study developed basic literacy with word processing, email and the web. The study further concluded that the children's digital literacy reflected their specific circumstances. The amount of exposure to a computer, the family's ability to purchase stable and reliable Internet connectivity, and the number of computers and their location in the home all played important roles in each individual's progress.

Socially, five elements were found to be key in shaping a child's computer use: (1) the parents' attitudes towards computer use; (2) parent's own skill level; (3) the amount of at-home leisure time a youth has which allows for more computer time to strengthen skills; (4) the habits of a youth's peers; and (5) the technical skill level of the youth's support group. In addition, two elements of a student's school environment also played an important role: computer-driven homework assignments and the direct instruction provided by a teacher in a structured classroom environment.

The report recommend programs that support in-home computers and training for both parents and children in computer literacy such that access to technology is convenient, easy to use and accessible. Home computer programs should not only provide technical support but should also help build individual troubleshooting skills and strategies. With the advent of technology-integrated entertainment and educational media, such as Sony PlayStation's new high-tech homework computer programs accessed via gaming stations and televisions just released this year, a child without immediate access to technology will continue to fall behind their more "wired" peers.

The Broadband Argument

Increasing importance is being placed on both access to computers and the quality of the access that is provided, both in terms of reliability and speed. In 2000, George Gilder wrote of the coming bandwidth revolution that he believes will have a greater impact on technology use than computers themselves. A point of reality–more information could be sent over a single cable via the Internet in the year 2000 in a second than over the entire Internet in a month in 1997 (Gilder 265). Recognizing that to be able to compete in the future and to rise with the rising tide of technology use, the work of One Economy Corporation transcends the commonplace web-based access point and physical learning center prototype. They are proposing that for these tools to achieve their maximum benefit potential, the services must be delivered "right to low-income people's living rooms." Multifaceted, technology-based ecosystem commitment also addresses housing agencies or other enterprises with facilitating the installation and activation of high-speed bandwidth in future affordable housing programs.

New software programs like GoToMyPC, developed by Expertcity, Inc., take advantage of the Internet and the large file transfer and streaming capabilities of broadband to offer services that allow individuals to network between office and home, or while traveling without copying or synchronizing files. Users of this software can seek real-time aid by enabling remote sharing of a computer, or even collaborate remotely with colleagues, friends and family.[14]

The perceived need to level the playing field in online service has led to some innovative governmental policy shifts. Because of One Economy's leadership and efforts, in 2001, the Oregon and Nebraska Housing Finance Agencies (HFAs) modified their tax credit allocation process to provide incentives to developers who wire their buildings for the future. In 2002 Kentucky's HFA, Kentucky Finance Corporation (KFC), became the first HFA to require that all housing units built with any state funds, low-income housing tax credits, grants or bond proceeds be capable of providing high-speed Internet access. KFC is also considering having computers be included in the development costs of its projects, and monthly broadband costs to be included in operating costs. In the spring of 2001, Senator Kerry (D-MA) and Senator Hatch (R-UT) sponsored federal legislation (Senate Bill 2479) to offer incentives to other state HFA's throughout the country to follow suit.

Next Steps: The Computer as a Household Appliance in the Subsidized Housing Arena

There are more than 5.5 million units of government-assisted housing in America operated by nonprofit organizations, public housing authorities, or for-profit owners that receive government subsidies. There are approximately 100,000 new rental units added each year by the Low-Income Housing Tax Credit Program (Hecht 21st Century 6).

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[14] More information on GoToMyPC can be obtained by visiting http://gotomypc.com/.

Many local initiatives have already been established that work with these organizations in an adhoc way to attempt to effectively deliver self-sufficiency opportunities. The Vesta Corporation, which manages over 13,500 housing units in eleven states is one such organization. Working with the Kerry Company, they have successfully placed computers directly into the homes of residents in select locations.[15] Other organizations involved in these efforts include the National Association of Housing Redevelopment Authorities, Local Initiatives Support Corporation (LISC), Mercy Housing and local housing authorities across the country. Cisco Systems has provided support to organizations like One Economy in the form of both technology and labor, and has also helped develop prototypes that effectively bring technology into affordable housing developments. One highlight of their work is the online "Digital Access Toolkit" that can assist home developers with determining appropriate wiring and network solutions.

Mercy Housing in California assisted residents in their Heritage Homes San Francisco community in obtaining a computer for each housing unit, and has connected each to high-speed Internet services. The San Francisco Housing Authority has also built a wireless network in its Hayes South HOPE VI community, and LISC recently assisted a Los Angeles-based CDC in providing computers and broadband to its housing units and community technology centers.

According to Hecht, JP Morgan Chase has not only invested in the technology of a middle school in Brooklyn, New York, but has also ensured that the 1,700 children that attend this school also have a computer in their home. In addition, the Annenberg Foundation provided some funding for a few of One Economy's projects to develop technology hubs that can link school, community centers, and homes in a way that makes a difference for lower-income families.

The Gateway @Edgewood Terrace and the Community Preservation and Development Corporation

In 1998, the Community Preservation and Development Corporation (CPDC), founded by Eugene Ford and now headed by President Leslie Steen to preserve affordable housing in the tri-state area, and the owners of Edgewood Terrace in association with its residents envisioned as a part of their on-going redevelopment plans a project called EdgeNet and the Gateway @Edgewood Terrace. The Gateway entailed the creation of a 40,000 square foot technology center that was different from the first learning center model implemented at Edgewood. Their vision began to explore the individualized use of computers, as CPDC's Vice President Albert J. Browne notes, to capitalize on the "value of investing in bringing technology, technology skills and opportunities directly to residents of low or moderate income communities to help them increase their education, income and as a community building tool." They believed that moving the computer from the lab into the home would further help to empower their

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[15] More information on Vesta Corporation can be found at http://vestacorp.com/.

residents to "use technology as a tool and to provide for some structured learning combined with further exposure and time for experimentation, investigation, and self-taught learning." (Community Preservation and Development Corporation). The ambitious plan was to create what they called an electronic village. Not only did they wire all apartments for Internet access via a T1 (broadband) connection, they envisioned an intranet, EdgeNet, which would also connect all residents with each other. Through a grant from Microsoft, HUD and the Department of Commerce, EdgeNet became a reality. The interface point would be a thin-client terminal connected to a main server that hosted the necessary software applications, making the terminals in each residents' apartment access points that are theoretically easier to maintain. Due to funding constraints, in 2001 just fewer than 80 units of the 592 units in the complex were actually equipped with "thin-clients" and only 90 additional units were connected by traditional PC computers.

Today, all units within the greatly expanded 800-unit Edgewood Terrace community and its broader seven associated sites serving an additional 2,040 units continue to be wired for broadband Internet access. Included in this 2,840-unit community is a newly created experimental senior program supported by a 20,000 square foot Wisdom Lounge and resource center (refer to Figure 12). With this senior center, which was completed on July 16, 2003, Edgewood Terrace has attained its goal of providing an all-encompassing technology-enhanced learning environment that includes all residents, no matter their age, skill level, interest, time or location.

A self-governing, resident-based, not-for-profit, advisory board called ETAB that families join for $24 a year now directs EdgeNet. Along with their membership, residents receive a thin-client in their residence and direct access to a suite of Microsoft Office products, email, and a host of educational software programs. In addition, a relationship with a national computer refurbishing company has been established for those wishing to purchase a computer.

At the youth Gateway Learning Center, children and youth can find after-school programs that are standards driven, project-based and technology infused, which start at 3:30 p.m. and end at 7:30 p.m. that are tailored specifically to lessons being taught in the Washington, D.C., school curriculum. A music technology center that will be operated by Berklee College of Music offers teenagers the use of electronic keyboards and a digital recording studio. Adults can expect to find state-of-the-art Dell Pentium 4 computers with LCD flat screen monitors and formal classroom settings in which to learn. Three 18-week sessions are offered a year during the day and in the evenings in which adults can earn three college credits from the Catholic University of America and Northern Virginia Community College in practical office administration and entry-level information technology. In addition, adults can receive assistance in career development areas that include resume writing and career planning. The new Wisdom Lounges and Electronic Village Elders Gateway in the Senior building will offer technology-based activities that are designed to "promote and support an independent and healthy lifestyle, celebrate and preserve the rich

heritage of seniors, maintain involvement and connection with their surrounding community, and offer programs that support marketable skills." In addition, plans are underway to offer medical and personal services, and bio-medical devices that are integrated into the lives of the seniors and the facilities they use. Today there are approximately 280 residents (150 thin-clients and 130 using their own computers and not connected to EdgeNet) directly connected to the World Wide Web via computers in their residences. The youth gateway learning centers, with its six full-time and two part-time staff, service more than 290 youths and 75 adults a day, and in five years of operation the learning center has graduated 560 adult residents from their credited program. Most, as Al Browne points out, have moved on to better lives where they are able to own or rent their own homes and apartments.[16]

The ingredients for a successful model for disadvantaged individuals overcoming barriers to successful technology integration in their lives are clearer. The Neighborhood Networks' facilitators speak of creating an environment that is not intimidating, coupling computer use with social activities, and providing activities and learning situations that are interesting to individual residents. They are also clear on the major hurdles to maintaining successful and viable learning centers; funding participation by community groups, and active participation by groups of residents. Often the success of a center hinges on a single resident or a few residents who have the time and interest to devote to maintaining the center, or as in the case of Edgewood Terrace, a concerted public/private and resident-based enterprise.

Figure 13 - *The New Senior Facility (bottom), Edgewood Terrace before CPDC Ownership (upper left), Edgewood Terrace after Renovation (upper middle and upper right) and youths in the recording areas (middle right). Photos courtesy of CPDC.*

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[16] For more information on Edgewood Terrace, the Edgewood Terrace Seniors Program and CPDC, go to http://www.edgenet.org/main.html and http://www.cpdc.org/housing/edgewood.html.

Conclusion

Can computers become more than just another implement for immediate access to a new venue of entertainment? Can the use of computers actually aid in increasing basic skill levels? Is there an advantage to a computer in the home as opposed to a computer in a learning center? While research by the National Center for Education statistics suggest that immediate access to educational resources in the home is a strong prediction of math and science academic success, another study of 1,400 students completed in 1999 by a rural Nebraska school district only serves to reinforce the notion that easy access is paramount to successful and sustained computer usage. Their study indicated that over extended periods of time computers may positively impact math and reading achievement for students, particularly those students functioning below the 50th percentile of proficiency (Isernhagen). More concretely, Vesta and the Kerry Company's comparison of December 2002 and June 2003 student participant grades (Grades 1-5) show marked increases of at least one letter grade in mathematics, reading, and science.

While there is a groundswell of both public and private support for technology advances in the subsidized housing arena, at the core of this support is the need to assist lower-income families with the often prohibitive expense of both a computer purchase and a stable broadband connection to the Internet. In the book, *High Technology and Low-Income Communities,* Manuel Castelles argues that this can only be done in a new sociotechnological society structure if the entire community is committed and mobilized toward the effort of providing not only access to jobs, but also to a means of generating an income. He further argues that just providing the technology is not enough to change an individual's fate, but that the transformation that can occur as a result of the use of this resource can change an individual (Schön 35).

Many other communities like Edgewood Terrace have already taken steps in this direction. As Hecht further reports, in Washington, D.C., Digital Access Funds make small loans of $500-600 per family such that home access can become a reality. In Hawaii, community supporters like Asuega accept any computer donation. They refurbish them through volunteer assistance, offer training classes on how to care for the computer, and the self-help group gives the equipment to interested families. The Vesta Corporation and the Kerry Company, along with the CPDC, are making inroads into providing broadband access included as a service to each unit, as well as a computer or thin-client, which is considered as an appliance to be cared for, maintained and planned for in their reserve budgets.

The argument could be made that learning center models and first experiments in moving computers into individual units are now beginning to indicate positive results. The computer has become almost as necessary to our modern day life as a refrigerator, and the ability to access and navigate through Internet-based information is a fast approaching baseline measure of literacy. The time may be right to embrace the computer as a household appliance in the "bricks and mortar" construction and care of subsidized residential units so that the last barriers, that of affordability and maintenance, are crossed in an effort to reduce the digital divide and level the playing field for all.

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