

PREPARED BY
The Tomás Rivera Policy Institute
FOR THE
IBM Hispanic Digital Divide Task Force



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POLICY INSTITUTE

Latinos and Information Technology: The Promise and the Challenge

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For the

IBM Hispanic Digital Divide Task Force

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Gratefully,

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Founded in 1985, The Tomás Rivera Policy Institute advances critical, insightful thinking on key issues affecting Latino communities through objective, policy-relevant research, and its implications, for the betterment of the nation.

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Executive Summary

From the beginning of time, the creation of certain technologies has driven periods of extraordinary achievement that are later identified as “revolutions.” Information Technology, which has literally transformed nearly every aspect of life, is now such a period. Though still in its infancy, IT has presented breathtaking opportunities for social and economic advancement that were well beyond imagination just a decade ago. But despite the scope and power of the IT charge, certain segments of society have been left behind.

Commissioned by the IBM Corporation, this report presents the results of an analysis conducted by The Tomás Rivera Policy Institute for the IBM Hispanic Digital Divide Task Force. Its goal is to focus national attention on how Hispanics can more successfully engage and prosper by the expansion of IT into every aspect of modern life.

Structure of the Report

Over the last few years, the “Digital Divide” has emerged as the nation’s most popular catch phrase to describe segments of society without access to Information Technology and its potential to improve life and livelihood. While noting the inequities where appropriate, this report focuses on the **promise** of the digital age, and the associated **challenges** that Latinos must surmount to join the revolution.

The promise of Information Technology for the Latino community will not be realized only by the acquisition of computers. Rather, technology must be viewed as the symbol of a much broader and more profound change in the world economy. The creation of wealth worldwide — as well as for individuals and families — is now inextricably linked to knowledge and technological innovation. For the Latino community to advance its social, political and economic agenda, it must be a player in this new world. To participate, Latinos must be proficient in the basic tools of technology, such as computers and their applications. But to achieve proficiency, they must also achieve a much higher general level of education and adapt their cultural norms and behaviors to an entrepreneurial, fast-moving and global approach to business and life.

Simply put, the promise of the digital age is inseparable from the larger change agenda that Latinos must accomplish, even if computers did not exist.

This “change agenda” includes the major challenge of understanding and benefiting from the digital age. To do so, Latinos must overcome issues of education and achievement — all of the ways that K-16 public education have failed the Latino community — and obtain access to and expertise in computers and the Internet. Barriers to physical access to technology must be overcome, and a mastery of key computer applications must be achieved.

The implications of this challenge are extraordinary — and there are no magic bullets. Gaining the background necessary to benefit from the IT revolution involves every aspect of how Latinos engage the U.S. educational system, and key solutions are likely to number in the dozens. Moreover, the needed improvements to education involve broad public policies, focused intervention programs and the widespread implementation of “best practices” that work. All of the changes required to guide the Hispanic community into the Information Technology age demand a better understanding of how to bring about change, and how to move “the system.”

The findings of this report are organized into three broad and interrelated topics. The first refers to issues of access to Information Technology in Latino communities, including the basic understanding that access is a quality-of-use issue, rather than counting numbers of computers per capita. The second section refers to learning technologies across the educational spectrum, while the third section addresses IT workforce issues, including the implications of educational attainment and achievement.

Findings

Access to IT

To benefit from IT, Latinos must have access. “Access” has many definitions and occurs in many settings:

Physical Access. This means access to the basic hardware, software, and Internet connectivity. Access also occurs in different settings such as home, school and business. The basic findings are:

- Home access to computers and the Internet is lower for Latinos.
- Home access continues to be associated with income.
- School access to computers and the Internet is somewhat lower for schools with a high percentage of minority and disadvantaged youngsters, though the gap is rapidly closing.

Cultural Access. As in many technology domains worldwide, English tends to be the language of choice in IT. This has important implications for Latinos:

- An increasing number, but a decreasing fraction, of Web sites are Spanish language or bilingual.
- Lack of Spanish language Web sites can be a determining factor in Latino use of the Internet, particularly among older, first generation immigrants with lower levels of education.
- Community relevance and cultural content are important predictors of Internet use by Latinos.

Commercial Access. Both consumers and businesses are increasingly using the Internet as the vehicle of exchange. Nonetheless, non-technological issues of access are quite important:

- Latinos are significant online shoppers, but the limited array of Spanish language consumer Web sites acts as a deterrent.
- Latino businesses, being mostly small and not technology-intensive, are not as deeply involved in e-commerce as their peers in other ethnic communities.

IT in Learning

Labeled “educational technology” or “learning technology,” IT in educational and training settings is having significant impacts on the learning community worldwide, including the Latino community.

Physical Access at School. As a result of various state and federal K-12 initiatives, the following seems to be established:

- The gap in K-12 access to hardware, software and Internet connectivity as a function of race, ethnicity and economic standing across schools is closing.
- The post-secondary institutions serving the Hispanic population has made effective use of distance education or distributed learning programs enabled by IT. However, across this community are great disparities in the quality and scope of the technology infrastructure.

IT and Educational Improvement. The debate and action agenda regarding IT in learning is rapidly shifting to the quality and context of applications. In other words, IT alone will have little impact on the quality of Latino educational achievement and attainment. However, a number of findings suggest that “quality of use” of IT is the most important area for future research and intervention:

- The skills, background and professional development of teachers and school officials are a significant factor in whether IT-enabled education will yield positive student outcomes.
- IT must be tied to important and validated school improvement efforts, such as increasing academic rigor, decreasing discriminatory tracking, and keeping students focused on staying in school and entering post-secondary institutions.
- IT-related educational improvement is compounded by the lower penetration of computers and high speed Internet access into Latino households. The negative impact is somewhat mitigated by community access or by student access to schools in the evenings.

The IT Workforce Pipeline

Despite the current and presumably temporary slowdown in demand for IT workers, the long-term prognosis continues to be positive. Nonetheless, Latinos tend to be underrepresented in the existing IT workforce, and the status of the “pipeline” is not encouraging. The relative lack of Latino involvement in high skilled IT jobs is an issue that is inseparable from more general shortcomings in educational achievement and attainment.

IT Jobs. Analysts have different opinions about what constitutes an “IT job” or, for that matter, IT industry sectors. The traditional definition has focused on education and training in the core disciplines of computer science and engineering, and their links to industries such as telecommunications, software, computer manufacturers and computer services. Current thinking is more inclined to include “IT-enabled” jobs, in a much wider array of industries. Thus, an individual doing part or component design with computer-assisted-design (CAD) tools in a manufacturing setting might therefore be classified as an IT worker. Key findings:

- IT jobs, however defined, are increasing in number and have high earning potential.
- IT-enabled jobs are increasing at a much faster rate than “core” IT jobs.
- IT jobs are becoming more dispersed, geographically and by industry sector.

Schooling and the IT Workforce Pipeline

While not necessarily specific to IT workforce issues, a number of educational problems are relevant. They include:

- Educational attainment and achievement is lower for Latinos than it is for most other racial or ethnic groups.
- Attainment and achievement are significantly impacted by immigrant status and nativity.
- School dropout rates are very high for Latino youth, and are both a symptom of prior school failings and a predictor of subsequent problems.
- There are few role models and mentors from the IT community that reach Latino youth. As a

consequence, there is insufficient understanding of IT-related career paths.

- Latino parents’ understanding of the importance of education generally, and of opportunities afforded by IT-related careers specifically, is quite mixed.
- There is a growing number of validated programs that work to improve Latino achievement and attainment, but they are not widely known or adopted.

Recommended Actions and Actors

Over twenty detailed action recommendations were made, and a number of organizations that could play some role in implementing those actions were identified. The following action themes seem most pertinent:

- Increase awareness throughout the Latino community — parents, community leaders, educators, business people — about the importance of IT in their lives and its relevance for future opportunities.
- Make IT more culturally compatible to the Latino community, in terms of content, tools, and future directions.
- Benchmark exemplary IT-related programs across a variety of settings — schools, communities, the private sector — and aggressively foster the dissemination and replication of these “best practices.”
- Close the “digital divide” in all its manifestations — cultural, physical and quality of applications.
- Focus significant resources and policy remediation on improving the educational attainment and achievement of Latinos.

The following organizational categories were identified as needing to play a significant role in implementing the action recommendations of the report:

- IT Companies
- Federal Education Agencies
- Federal IT-Related Agencies
- Higher Education Institutions
- State and Local Education Agencies
- State and Local Elected Officials
- Private Foundations
- Community-Based Organizations

I. Introduction

The revolution underway in information technology (IT) is increasingly affecting the lives, communities, educational prospects and culture of Latinos. The digital revolution has created opportunities to improve our economic outlook through high-wage IT jobs, reinvent our public institutions through the creative use of digital media, develop our social networks, and enhance educational outcomes for children and adults.

The globalization of the world economy is transforming the way people work. Economic opportunities increasingly require digital literacy, and learning computer programming and multimedia skills is a viable way to earn a livable salary. The five fastest-growing careers in the United States are in computer-related fields and they offer above average earning potential (U.S. Department of Education, 1999).

The Internet creates many new ways to conduct government and deliver social services. For example, telemedicine widens the ability of doctors and health care systems to deliver higher quality care to patients, especially in remote and rural areas. The delivery of government services to citizens, known as e-government, is gaining momentum in every part of the country. E-government can potentially allow the delivery of better and more personalized services at less cost, and at the convenience of the citizen (Galbi, 2001).

For children, the use of computers and network technologies can improve educational achievement and increase motivation to stay in school. For adults, online classes can help meet a range of educational goals: learning word processing, obtaining a GED, taking citizenship classes, and earning a university degree.

The Internet has been transformed from being primarily a data resource for researchers to a multimedia resource serving entertainment, educational and commercial objectives. This raises the importance of access to high-speed Internet access, or broadband. Faster connection speeds improve the overall online experience, encouraging users to explore more sites and spend more time online. Streaming media is a major driver behind broadband adoption in the general population, and is likely to be for the Latino community as well. The added activity benefits e-commerce sites and content producers.

II. Access

In order to realize the benefits of digital technologies, Latinos must first have access. Their relative lack of access has been described as a “digital divide,” a catch phrase, but one that is somewhat simplistic. Access has several dimensions and venues, each with its own characteristics and issues. One is **physical access** to the basic hardware, software, and Internet connectivity. Second, is **educational access** whereby Latino learners can have the opportunity to use IT in educational and training settings. Third, is **community access** via which Latinos can utilize the technologies in organizations in their neighborhoods. Fourth, is **cultural access** such that Latinos can avail themselves of websites, IT tools, and digital products that are in Spanish or bilingual and that are culturally compatible as well. Fifth, is **job access** whereby Latinos with the appropriate skills and education can avail themselves of a host of new job opportunities, in both core IT industries and in industries that are going through a productivity renaissance that is enabled by information technology. The digital divide is in many ways a “digital job divide.”

Physical Access

While there is indeed a physical access variant of the “digital divide,” it would be incorrect to describe the U.S. Latino population as absent from the digital age. Researchers at the Tomás Rivera Policy Institute (TRPI) estimate current Latino Internet usage in major metropolitan areas at approximately 40%, although this figure varies considerably across the country. Based on data from the National Telecommunications and Information Administration (NTIA, 2002) and the U.S. Census Bureau (2000), nearly 14 million Latinos own computers and over 11 million have access to the Internet from home. Latinos online in the U.S. in 2000 exceeded the number of Internet users in Spain (5.4 million) and Brazil (5 million) and were roughly equivalent to the number online in all of Spanish-speaking Latin America (8.4 million) (ITU, 2000).

With 35 million Hispanics, the U.S. is the fifth largest Hispanic country in the world. Nearly half of Hispanics in the U.S. are foreign born and Spanish dominant: many of these can read some English and most can speak some English. As such, they constitute an

impressive market for electronic commerce, with an estimated buying power of over \$450 billion.

These data notwithstanding, there continues to be a gap in access to computers and the Internet between Hispanics and white, non-Hispanics. For example, according to the latest Department of Commerce study, while **national computer** ownership rates in 2001 were up from the previous years, a significant disparity persists:

| | <u>2001</u> | <u>2000</u> | <u>1998</u> |
|---------------------|-------------|-------------|-------------|
| Hispanic | 40.0% | 33.7% | 25.5% |
| White, non-Hispanic | 61.6% | 55.7% | 46.6% |
| All U.S. Households | 56.6% | 51.0% | 41.2% |

Similarly, the **Internet penetration** rates for households across the country were:

| | <u>2001</u> | <u>2000</u> | <u>1998</u> |
|---------------------|-------------|-------------|-------------|
| Hispanic | 32.0% | 23.6% | 12.6% |
| White, non-Hispanic | 55.4% | 46.1% | 29.8% |
| All U.S. Households | 50.5% | 41.5% | 26.2% |

The same technology gap exists as a function of socioeconomic status, whether measured by income or levels of education. If you earn over \$75,000 per year, and are well educated, it is much more likely that you will have Internet access at home (NTIA, 1999, 2000; TRPI, 1998). Ethnic and racial differences continue to persist even when income and education level are controlled.

Although these data are important, the focus of the national dialogue on the digital divide should become focused on how the technology can be more effectively used, rather than physical access. This shifts the policy and program debate to the human resources component—skills, training, professional development, and users.

Educational Access

In public schools there has been until recently significant inequality in terms of Internet access, particularly as a function of economic status. In 1999, 63% of all classrooms had Internet access: 74% of classrooms in the wealthiest schools were connected, but only 39% of classrooms in poorest schools were connected (NCES, 2001). By 2000, 77% of all classrooms had access, but once again only 60% of

classrooms in the poorest schools were connected, compared with 82% of wealthiest schools. While the gap in schools is closing, there is still some distance to cover.

There have been major changes in these indicators pertaining to minorities. Thanks to enabling legislation that made it easier and cheaper for schools to get Internet access, and because of the actions of local and state educational agencies, there are more computers in schools and more of them with high speed Internet access. According to data from the National Center for Education Statistics (Cattagni & Farris, 2001), between 1994 and 2000, much of the classroom-based digital divide as a function of minority enrollment has closed. For example, the study looked at schools with four different levels of minority enrollment, ranging from less than 6% to 50% or more.

In 1995 the percent of public schools with Internet access, by minority enrollment, ranged from 39% in schools with the highest minority enrollment to 52% in schools with the lowest minority enrollment; by 2000 that range was from 96% to 98%. Similarly, the percent of instructional rooms with Internet access ranged from 13% to 37% in 1997; by 2000 the range was 64% to 85%. By 2000, students from high minority enrollment schools were more likely to have school-based Internet availability outside of regular school hours than their peers in low minority enrollment schools. This does not mean that the gap in home-based access to computers and the Internet has closed as well. For example, we know that only 18% of Latinos use a computer at home versus 52% of whites (ERIC, 2001).

As schools become digitally connected, academic achievement tends to increase. Students attending schools with good media libraries have been shown to do better scholastically. A recent study reports that 71% of middle and high school students primarily rely on the Internet for homework that involves information-gathering and research, far above the 24% who primarily rely on libraries (Pew, 2001). Other reviews indicate that, if educational technology is tied to school reform and integrated into instructional delivery, it will enhance student educational outcomes (NASBE, 2001).

Nonetheless, there are still lagging disparities across and within school districts in the pace and, more importantly, the quality of technology implementation. For example, the Los Angeles Unified School District

has only recently begun to implement a planned strategy for the deployment of information technologies across the district, and instead left deployment to local site administrators. This resulted in an uneven distribution of technology across the district. The problem can be further understood when we look at the results of a 1999 Department of Education study reporting that most new teachers do not feel well prepared to use technology in the curriculum. Since many Hispanics use the Internet for the first time at school, and many use the Internet primarily at school, the implications for increased Hispanic access are clear (NCES, 2001; NTIA, 2000; Pew, 2001).

Libraries located in low socio-economic status neighborhoods are significantly less likely to have public Internet access. An estimated 47% of libraries located within areas of more than 20% poverty had no public Internet access in 1999 (Bertot & McClure, 1999). Also, to be fully beneficial, Internet access must be freely available to community members on a regular basis. One terminal available on a limited basis does not constitute public access.

As will be discussed below, the debate on educational access is shifting away from simple availability of computers and high speed connectivity to the Internet. For educational technology to have the maximum possible impact on Latino children it must be integrated into the task of learning and tied to educational reform. In addition, students must have experiences that enable them to see the link between computer skills and increased life chances. They need to be exposed early to career paths and the job opportunities afforded by computer skills. One key to reducing Latino dropouts is to increase the perceived relationship between schooling and "real life."

Community Access

In the absence of high levels of home computer and Internet access, TRPI research has demonstrated that Latinos are more likely to turn to public institutions such as schools, libraries and community centers. These public institutions serve as technology "safety nets." However, even in public institutions there is evidence of the digital divide. Community centers are viable mechanisms to serve the communication and information needs of low-income communities. They serve as a technology resource, providing "a solid, extensive experience base from which community

leaders, funders, elected officials, and corporate leaders can draw” (Fowells & Lazarus, 2001). Community-based organizations (CBOs) provide a natural interface for Latinos, since they are located close at hand, and they have established trust and comfort levels to ensure that their services will be utilized. CBOs can be very effective venues for community and economic development in underserved neighborhoods by bringing together technology and training with local initiatives that strengthen the community.

IBM's Teaming for Technology (T4T) program helps nonprofits build their technological capacity, including creating technology plans and conducting training. For instance, in New York City, the Hispanic Federation was a key partner with IBM and the United Way in the T4T program. The Hispanic Federation helped to create technology plans in its network of more than 70 agencies that serve the Latino community, and identified the agencies that were ready for technology. The Federation then helped to install and maintain equipment in the selected agencies, and train the staff. The Federation even helped to select three agencies to receive computer labs that became a community technology resource (IBM, 2001). Moreover, some technology centers, such as the Computers in Our Future and Harambee programs in California, as well as others around the country, specifically seek to build leadership capacity within underserved communities (Fowells & Lazarus, 2001; TRPI, DSS, forthcoming).

Aside from physical access to computers and the Internet, the most significant barriers to digital opportunity facing Latinos today revolve around the lack of skills and training to use network technology. CBOs can play a significant role here. Many people needing assistance in learning the skills needed to navigate the Internet and using computer applications frequently turn to public access centers, even when they have a computer at home. CBOs remain an avenue with great potential for educating and building informed consumers in under-served communities. For many community-members, a CBO represents a comfortable, familiar environment in which to gain new skills.

Nevertheless, many CBOs are currently unable to provide any or enough connectivity to the public, and they remain under-utilized. A continuing concern for CBOs is that some initiatives may raise expectations and not be able to deliver because of sustainability issues.

Cultural Access

As the Internet continues to develop, a logical and expected consequence is the diversification of the services and information available online. Yet another access barrier to Latinos is the dearth of culturally sensitive, language appropriate content that is also community relevant. The Internet developed as an English language medium, and the content has been primarily created in the U.S. While this is changing as the percentage of U.S. web pages is decreasing compared to web pages from other countries, there is still a need for culturally appropriate content that is specific to Latino community needs.

The Children's Partnership reports that millions of low-income and underserved Americans face a “content gap” online, with content either non-existent or difficult to find (TCP, 2000). According to this report, these populations are most interested in local information, job listings, information at basic literacy levels, and content for non-English speakers that extends to cultural practices and health matters. A July 2000 count by the Spanish-based Vila web estimated the number of web pages in Spanish to be 7.5 million compared to 214 million web pages in English. Hispanic users continue to prefer mainstream portals, and Yahoo! has increased its lead as the primary portal for U.S. Hispanics going online in English (Cheskin, 2001). Just as Australian or other English-language websites are less interesting to U.S. users than American websites, Latinos prefer websites that are more relevant to their local communities than what Spanish or Argentine websites can offer.

What is distinctive about the Latino digital divide is that English language literacy stands out as a substantial determining factor of the degree to which Latinos can access the wealth of information and resources on the web. The web, despite its early promise of becoming a global community, is still heavily English-based and has generally lacked a true mix of cultural viewpoints.

Among those Latinos who are online in the U.S., over 10% cite insufficient Spanish content as a perceived drawback to the Internet. This potentially long-term issue will lessen for some members of the Latino community, as they become increasingly English proficient. However, given the large and growing number of first generation Latinos, the issue of Spanish and bilingual language content will continue to be important. Commercial interests will further develop the Latino market, Latinos will increasingly become content developers, and a growing number of non-profit and community-oriented sites will appear.

Nonetheless, these data describe an opportunity for content players in the Hispanic market as more Spanish-dominant consumers go online. Latino websites must do more than translate content from English to Spanish; they must provide content that has cultural interest to address the special communities they serve in order to entice an audience that generic web sites will not attract. However, if web portals are too narrowly focused and no distinctive characteristics relative to competitors, they can also fail.

Technology can be intimidating and impersonal for the novice user, even one who is English proficient. This "technophobia" can be overwhelming when combined with limited English proficiency. Regardless of one's language, Internet usage requires a certain degree of competence. It is wholly unlike radio and television -- being audio and visual media -- and more like newspapers and books. However, with time and training it opens doors to opportunity and empowerment.

Employment Access

Much has been written about the burgeoning of the knowledge economy, and the associated demand for "knowledge workers." The majority of new jobs--even at an entry level--will require some amount of postsecondary education (Carnevale & Reich, 2000). In addition, "knowledge worker" is increasingly being defined in terms of the ability to use computers and networked technologies to solve problems and execute tasks. An important part of "access" for Latinos is being able to qualify for the knowledge jobs that pay well and offer career paths to the future (Jenkins, 2001). Many of those jobs are in industries in which IT has enabled dramatic increases in productivity.

Relevant conclusions:

- Ensure that communities have equitable opportunities to benefit from emerging information technologies by increasing the number of Latino households with networking resources.
- Promote awareness of the importance and value of information technology in Latino communities.
- Cultivate public access points where the Latino community can learn to use and manipulate network technologies.
- Focus on the quality of use of educational technology, and its applications to improve student learning.

Key Issues: Access

Language and Cultural Content. Latinos have had a relatively late entry in using and contributing to the World Wide Web. The pervasiveness of content developed in the United States, and by extension, of its culture, has led to concern that the Internet is contributing to a general homogenization of culture. Market values have contributed to this trend. However, there are countervailing influences, including the development of websites and content in other communities, countries and languages. According to current research, as much as 50% of all online sales will be sold outside the U.S. by 2004, suggesting that multilingual sites may be essential for companies to succeed in the new economy (Forrester, as cited in Pastore, 2001). The U.S. Latino community can likewise increase the amount of relevant content by creating that content. A pressing question is how one transitions from being a passive user of technology to being a producer of technology, a producer of content, and a creator of knowledge. Nonetheless, while non-English websites will increase in absolute number, the fact that English has been for decades the overwhelming language of choice in global business lessens the relative prominence of this trend.

Present research efforts by TRPI have been directed toward gaining an understanding of these issues. Investigations of usage patterns and characteristics of Latinos online were conducted by TRPI in 2000 with surveys in Los Angeles, New York, Chicago, Houston, and Miami, along with focus groups in Los Angeles and New York.

Internet Usage Patterns. The survey results indicated that Latino Internet users are a population of both experienced users and “newbies.” While 40% of those surveyed indicated that they had been using the Internet for three or more years, 29% reported less than one year of experience online, including 15% at less than six months. The more recent Pew Internet Project (2001) reports similar figures, with 24% having less than one year of experience, and 14% at less than six months. This translates into a population that on one hand is already established and experienced with the Internet, and on the other hand, is new to the Internet and requires user-friendly applications and web pages that are easy to navigate. Moreover, Latino Internet users are actively online, with six out of ten going online five days a week or more, and an additional two out of ten using the Internet three to four days per week. Furthermore, nearly 60% of Latinos who use the Internet spend over an hour online each time they log on. These findings have been corroborated by several other studies (Cheskin, 2000; Pew, 2001; TCP, 2000).

The focus groups further explored Latino Internet use, existing Internet content, and Latino community needs for online content, including why Latinos are not accessing the Internet. Findings from this study indicate that both Internet users and non-users are aware of the variety of positive functions that the Internet is able to serve. The discussions pointed to communications, and access to information and research as the most important reasons participants use the Internet. While online purchasing among participants who use the Internet varied, they are using the web extensively to obtain product and company information. While focus group participants indicated they would like the Internet to be more reflective of Latino culture, such content is not the primary factor required to increase Latino Internet use. Rather, it is the more practical issues--such as lack of computer hardware, affordable access to an Internet Service Provider, and a general lack of computer related skills--that inhibit Latinos from getting online. In addition, fears and misconceptions about the Internet, as well as intimidation due to weak language skills or lack of understanding of the technology, play a role. It is only after these other obstacles to access are overcome that Latino Internet content becomes important.

To illustrate, focus group participants who were already Internet users stressed the desirability of Spanish/English language options for personal reasons as well as to assist Latino populations, implying that bilingual and Spanish-language sites serve a valuable purpose in the Latino community. Focus group participants further expressed a strong interest in content that is relevant to the community in which they live.

As with most other segments of the population, the primary point of access for Latinos is at home, followed by work and then school. Latino households tend to be larger than non-Latino households. The Bureau of Labor Statistics reports that the average Latino household is 3.2 persons while non-Latino households consist of only 2.4 persons. It is not surprising then, that four or more people are using the computer to access the Internet in 25% of Latino households. Furthermore, approximately 6.4 million Latino households do not have access to the Internet at home, work or school. Of these, 38% indicate that they plan to gain access to the Internet in the near future. Therefore around 2.4 million new households will be shopping for PCs, connecting to the web, and looking for Latino-oriented content online.

All the different elements that go into programming and designing a website are meaningless unless the end-user has an enjoyable experience and becomes a repeat visitor. What keeps Latino Internet users coming back to a particular website is primarily interesting content, followed by fast loading pages, interesting graphics/layout, and free services such as e-mail and chat. This suggests that resources used to create high-tech web design and a specialized look are not nearly as important as the actual content that the site offers to users. This finding is similar to general studies about why people are repeat visitors to websites.

Not surprisingly, over half of Latino Internet users indicate that they visit websites that are “Latino and/or Latin American-oriented.” Of those that visit these sites, about one-third use U.S. Latino sites more, one-third said they use Latin American sites more, and one-third use both types of sites equally. Furthermore, nearly 50% of Latinos use e-mail to correspond with friends and family in Latin America and many would be interested in using the Internet to send secure money transfers to Latin America.

Latinos as Online Shoppers. With approximately 11 million Latinos using the Internet in 2000, there is a large potential Latino e-commerce market. This survey found that 43% of Latino Internet users have made an online purchase, or about 3.5 million Latinos nationwide. The Pew Internet Project also reported that 43% of Hispanics have made online purchases (2001). The most frequently purchased items are books, news and educational materials, followed closely by music, videos and electronics. Clothing is the next most purchased item, followed by computer software and hardware, travel reservations and toys and gifts. Home and office supplies, flowers, health and beauty products and food all ranked low on the list of items purchased.

These patterns closely match those of the general population (Pew, 2001). In general, Latinos are more likely to purchase products on English language websites, but not by a large majority. Half of the respondents preferred English language e-commerce sites, but 21% preferred Spanish language websites, and an additional 23% used websites in both languages equally; 44% could be described as potential Spanish language e-commerce customers.

Spending patterns online vary among Latino e-shoppers. Most Latinos spend between \$50 and \$100 on a typical online purchase. With approximately 3.5 million Latinos engaging in e-commerce, that equals nearly a half billion dollars into the "dot.com" market each time Latinos buy online. Further, Latinos tend to be very satisfied with their purchases and are likely to shop again online.

Latinos and e-Commerce. While the popular conception of e-commerce is focused on consumer-oriented websites, the most profound growth of applying the technology to business has been in business-to-business (B-to-B) relationships. For example, small manufacturing companies may be parts or components suppliers to major original equipment manufacturers. Whereas 15 years ago, ordering, billing, or inventory management in such a relationship would have involved the exchange of paper and phone messages, today it is electronically mediated over the Internet, or via private intranets. Unfortunately, Hispanic businesses have also underutilized network technologies and their e-commerce applications (TRPI, 2001). Most Hispanic

businesses tend to be smaller than average, and with even the larger of these spending an average of only \$2,000 on their websites for start-up costs and operational expenses, the ability to compete is marginal. An e-commerce website that is customer-friendly, well-integrated with the company's activities, and using upgraded technology is likely to cost considerably more (CHCI, 2000; TRPI, 2001). These shortcomings are exacerbated by the relative shortage of Latino engineers and computer scientists, who might play a role as a principal in an e-commerce company.

Privacy Issues. Finally, the issue of online privacy is a major concern for Latino Internet users. Two-thirds of respondents report concern about ensuring their privacy and preventing personal information from being obtained from the various websites that they visit. These data have also been corroborated by similar studies (Cheskin, 2001). It is possible that there is only a perception that privacy is an issue online, due to the large amount of media coverage surrounding occasional website break-ins by hackers, but it is a potentially devastating perception for dotcoms whose businesses rely on users feeling comfortable and at home on their websites. The patterns of concern regarding privacy within the Latino community do not differ markedly from those in the general population.

Relevant conclusions for this section are:

- There continues to be a lack of online content that is culturally and community relevant, and in Spanish or bilingual.
- Latinos represent a growing and robust potential market for online sales.

Action Opportunities for Improving Access

What is missing from public and private efforts designed to narrow the Latino digital divide are concerted efforts that combine limited resources, and focus on replicating what has been demonstrated to work. The following are recommendations to bridge the gap in access to network technology for Latinos:

Develop Leadership and Vision around IT from within the Latino Community. Latino leadership needs to "own" the fact that economic and social development goals can be more quickly realized via greater efficacy in IT. Create new opportunities for

leadership development, such as training, mentorship and job shadowing. Look to existing programs—for example, the Computers in Our Future program, and IBM's MentorPlace program—for best practices. IBM MentorPlace provides IBM employees with an innovative opportunity for volunteering “virtually” in schools. Through the program, IBM employees engage in structured online activities that include mentoring, tutoring, and classroom projects with students and teachers.

Replicate and Disseminate Successful IT

Programs. Find examples of existing community projects that are demonstrably effective in allowing Latinos to experience the fruits of digital opportunity. These exemplary programs should be documented, described and disseminated nationally.

Make Networked Computers Publicly Accessible.

Develop public access points with broadband Internet capability. These might include digital kiosks at shopping malls, terminals in community centers, or programs based in schools and libraries. All should preferably include staff assistance for first-time users. How to access and use the information that is available through the Internet is an important part of overcoming the digital divide for Latinos.

Educate Latinos about the Value of the Internet.

It is essential to educate Latinos about the value of advanced technologies—how to use computers and the Internet and its relevance to them—in order to increase the use of technologies within their communities. Information technology can offer opportunities to surmount social and economic obstacles. Besides access, IT programs offer skills training, tutoring in applying for jobs, night-time English as a Second Language classes, and other classes needed to enter the work force. Programs that demonstrate the wide range of uses will likely garner the most engaged and active Internet users. Outreach efforts should include Spanish language media.

Effective strategies to accomplish this goal should also include programs that encourage families to learn to explore information technologies together. The dual benefit of such programs is that parents can take an active role in overseeing their children's Internet experience, while driving home the value of these

technologies to their education experience, career, finances, shopping and other activities to their children and themselves.

Increase Spanish and Bilingual Websites and Content.

Create culturally appropriate content in English and Spanish specifically for the Latino community, and make it relevant to local communities. Support initiatives that encourage the transition of Latino users from passive consumers to active creators of content to increase Latino-specific online content. While such initiatives carry a high cost, the investment is worth making to enhance cultural values, and give Latinos a voice to make significant cultural contributions through this medium of the 21st century.

Develop Reliable Translation Software.

While current software is useful in making first-cut translations, it continues to have low accuracy rates, especially with culturally specific interpretations. However, it should be stressed that content created specifically for Spanish and bilingual Latino needs is greatly preferable to translated content. IBM has developed speech recognition software that enables users to surf the web, execute online transactions, dictate text and access information by speaking into a computer microphone, mobile device or a telephone. As part of its Reinventing Education program, IBM's Watch-me!-Read software is being used to teach reading in the early grades at the Houston and Philadelphia school districts which have a large concentration of students who only speak Spanish. A version of the software is being used at seven adult literacy centers across the nation—including in the South Bronx with a largely Latino population—to help adults gain literacy skills, whether or not they are fluent in English.

Provide Incentives and Technical and Marketing Training for Latino Businesses to Expand their Web Presence and E-Commerce Activities.

Most Latino-owned businesses are small, and often operate in low-margin service sectors. A mix of public and private programs should be implemented, including building the capacity of Hispanic-serving colleges and universities to provide e-commerce curricula and services, such that Latino businesses can take advantage of e-commerce opportunities. Businesses should be encouraged to invest in e-commerce to capitalize on the digital economy, and to move these companies into high value-added markets.

In addition to focusing on existing Latino businesses, a public-private infrastructure needs to be developed to foster entrepreneurial, e-commerce start-ups. For example, there is a national network of over 600 business incubation programs, with approximately 100 focused on technology-based fledgling companies (Tornatzky, Batts, McCrea, Lewis, and Quittman, 1996). No more than a handful of these are focused on Latino communities and e-commerce opportunities, which represents a huge public policy failing.

Provide Communities with Opportunities to Use Technologies so that the Community Can Adapt them to its Particular Activities. It is essential to have a robust technical infrastructure and intuitive applications built around community activities. In many cases, lack of technical expertise and a focus on teaching office software applications makes centers less effective and attractive. There is no shortage of innovation and enterprise once communities begin to realize the potential of computer resources. These include applications that help people communicate with each other, share ideas and find out what really interest them.

Provide Opportunities for Teachers, Parents, Communities, and Businesses to Collaborate around IT. Support community efforts that build on the diverse resources which partnerships can garner. Private/public partnerships in education and library settings extend the limited resources under which these institutions often function in underserved communities. This represents opportunities to uncover best practices and create experimental programs that allow us to study and describe the process by which these groups can work together.

III. Learning

The potential payoffs of IT in teaching and learning applications are several: (1) there is great potential for technology to enhance learning, educational attainment and achievement; (2) the acquisition of IT skills in an educational context can launch students on IT career paths and make them much more attractive to employers; and (3) educational technology can change learning to an “any time, any place” mode of delivery.

Learning Technology

Not only is technology in education important to prepare students to be competitive in the workforce, but technology may also enhance the quality of education (NASBE, 2001). Several factors create a compelling rationale for greater utilization of technology in education. Computer use in the classroom creates greater student “engagement” and appears to increase time-on-task, an indicator that suggests students are focusing on the learning exercise. Given the critical dropout rates and college retention rates of Latino students, any approach that increases motivation and interests can have secondary benefits in this area as well.

Research indicates that when computer technology is effectively implemented in the educational system, teacher outcomes can be positive. Specifically, teachers show an increased interest in teaching and experimenting with new applications for technology, an increase in time spent on individualized instruction and mentoring, and improved communication with colleagues and parents. There is a growing trend toward learner-centered and project-based learning in which computers are used as a tool for the learner to accomplish more diverse and complex learning goals, as opposed to the once-common approach to teaching students computer-related skills as separate subjects. Furthermore, these activities are more often taking place in individual classrooms as more technology is deployed there. Integrating technology into the curriculum and placing the technology in the individual classrooms facilitates the integration and consolidation of computer and learning endeavors. The National Research Council (Bransford, Brown, and Cocking, 2000) concludes that technology can be used to

create an effective learning environment in five ways:

- Bringing real-world problems into classrooms through the use of videos, demonstrations, simulations, and Internet connections to concrete data and working scientists.
- Providing “scaffolding” support to augment what learners can do and reason on their path to understanding. Scaffolding allows learners to participate in complex cognitive performances, such as scientific visualization and model-based learning, that is, more difficult or impossible without technical support.
- Increasing opportunities for learners to receive feedback from software tutors, teachers, and peers; to engage in reflection on their own learning processes; and to receive guidance toward progressive revisions that improve their learning and critical thinking skills.
- Building local and global communities of teachers, administrators, students, parents, and other interested learners.
- Expanding opportunities for teachers’ learning (p. 243).

A recent evaluation of IBM’s Reinventing Education program (Education Development Center, 2001) indicated that investments in educational technology produced improvements in student performance, classroom management, and teaching quality. The program, which was launched in 1994, reports significant performance gains for students in grades 7 through 11, and has now been expanded to 21 school districts and states and eight countries. The Watch-me!-Read software doubled gains in reading and reading comprehension in the Houston Independent School District, which has a large population of Latino youngsters.

The lesson of initiatives such as this IBM program is that the effective use of educational technology must be tied to school and curricular reform. Educational technology is not an end in itself. It must lead to standards-based reform, intellectually challenging curricula, and getting underserved and minority students “untracked” from dead-end schooling that is neither challenging nor relevant to their real world future.

In summary, learning technology has the potential to increase student motivation, improve learning outcomes, and engage teachers more effectively in K-12 schools and colleges and universities. These outcomes have important positive implications for Latinos.

Postsecondary Distributed Learning

In addition to the technology-enhanced learning capabilities mentioned above, the rapid expansion of information technology in postsecondary education has also resulted in more opportunities for delivering instructional programming through distributed or distance education programs. Distance education is defined as “education or training courses delivered to remote locations via audio, video, or computer technologies, including both synchronous and asynchronous instruction” (NCES, 1999). Distributed learning encompasses distance learning and the use of technology to enhance learning on-campus and for local “commuter” students. The most significant benefit of distributed learning is that education becomes available “any time, any place.” This widespread availability can increase access among traditional and non-traditional postsecondary students who because of work, family, geography, finances or other constraints, either cannot attend a “traditional” college, or cannot always be on-campus. The relevance for Latinos is obvious because these constraints are among the most important obstacles to being involved in postsecondary education.

Postsecondary distributed or distance education programs have increased significantly over the past decade. Data from the National Center for Education Statistics (NCES) indicate that for the 1997-98 school year approximately 34% of two-year and four-year postsecondary education institutions offered distance education programs with an additional 20% planning to offer distance education in the next three years (NCES, 1999). Such programs were much more common in public schools, with 78% of public four-year institutions offering distance education compared to 19% of private four-year schools. Distance education was also more likely in larger schools, with 87% of schools with 10,000 or more students offering distance education compared to 19% of schools with less than 3,000 students. However, because the majority of students enrolled in postsecondary education attend public schools (77%) as well as schools with a population

over 3,000 (81%), most students have access to distance education. Overall about one million undergraduates and 280,000 graduate students were enrolled in distance education courses during the 1997-98 academic year (ibid).

Despite the increase in the number of distributed and distance education programs, research data on its impact on the Latino community are limited, as are more general data on access and participation. The National Center for Education Statistics study concludes:

Currently, there is very little information available on how many students are actually making use of distance education course offerings, and we know even less about the characteristics of distance learners. Without such information, there is no way to know whether distance education is reaching those who might not otherwise have access to postsecondary education, or simply accommodating those who already take advantage of such opportunities. (NCES, 1999).

Without this information, it is impossible to draw conclusions about the extent to which distributed or distance education is reaching the Latino post-secondary market.

One research topic that has been of considerable interest to distance education is the question of “comparative impact”. That is, if one compares students taught in a traditional setting versus those reached via distance education, what are the differences in terms of learning and other outcomes? Across hundreds of studies, the most common finding (Russell, 1999) in comparative evaluation seems to be “no difference.” However, this becomes in effect a very positive endorsement of the expansion of distance learning. When one factors in the savings in time, money, and logistics for non-traditional students, the balance is arguably tipped toward the distance learning approach. Another research and program development issue in distance learning is that of standards and guidelines for curriculum development. That is, what constitutes an exemplary distributed-learning offering? What are best practices in the presentation of materials, student assessment, or the fostering of interaction among participants, both instructional and student?

Although the potential benefit of distributed or distance education for Latinos may be high, it is most hampered by limited home access to high speed Internet service. In actuality, the “any time any place” vision of distributed learning typically involves an individual hunched over a computer during the late hours. If that computer is absent from a Latino home or dorm room, or the Internet access is snail slow, the potential for distributed learning will never be realized.

In summary:

- Distributed learning, at all levels and in many venues, is rapidly increasing. Given the advantages of logistics, cost, and “virtuality,” the approach has potential in solving many issues of Latino educational attainment. Some of the most dramatic impacts may be realized with adult learners who are already in the workforce.
- Limited home and campus access to computers and high speed Internet among Latinos is a critical problem in the greater use of distributed learning opportunities.

Educational Access--Changing the Terms of the Debate

Much rhetoric and writing has been devoted to the “digital divide” that has separated Latinos and other minority groups, particularly in lower income communities, from the opportunities afforded whites in using computers in educational settings. In the early years of this debate, much of it was focused on the deployment of computers into classrooms, and the availability of high-speed Internet service. For example, the ratio of students per computer has been and still is a common metric for the utilization of learning technology.

Nonetheless, other recent NCES data on K-12 indicate that the quality of use of technology by classroom teachers differs markedly as a function of school characteristic. These are the more compelling statistics, strongly suggesting that “use” is much more than merely the presence of hardware, software, and Internet access. Specifically, teachers in low-minority and low-poverty schools were more likely to use computers or the Internet for a wide range of activities (57%) than were teachers in high-minority and high-poverty schools (41%) (Smerdon, Cronen, Lamahan, Anderson, Iannotti & Angeles, 2000). These data

indicate an important need to not only provide schools with access to technology but also to provide adequate support and training to effectively integrate technology into the curriculum. For example, in a 20-state study of K-12 “best practices” in implementing learning technology, the most pressing need voiced by faculty was for additional time and resources for professional development in applications of the technologies (Casson, Bauman, Fisher, Lindblad, Sumpter, Vickery & Tornatzky, 1997).

There are undoubtedly other factors contributing to these figures on the quality of use of learning technology. For example, all things equal, poorer and minority K-12 schools tend not to attract the most experienced “master teachers.” Teacher turnover is often higher, as is administrative leadership. The point is that closing the quality-of-use gap will not spring automatically from more intensive professional development and training in the technology. Poor and minority schools differ on a variety of dimension, and the application of technology is only one of the more important.

While hard data are mostly nonexistent at the postsecondary level in terms of access and effective use of distributed learning, informed observers indicate that Latino-serving institutions are somewhat at a disadvantage in terms of hardware, software, infrastructure and staff training. Nonetheless, within this community a number of initiatives are underway to close this gap. For example, HACU is involved in a strategic partnership with EDUCAUSE (Ramirez, Davis, Harris & Staudt, 2001), the leading information technology organization in higher education working on this issue. This National Science Foundation-sponsored network development initiative with a number of its member institutions, as well as other associations of minority-serving institutions, is expected to positively impact distributed learning as well as other IT applications and planning. In the postsecondary context as well, the most problematic issues involve faculty development. In one study (Irani, 2001), a survey of postsecondary faculty found that only 7% considered themselves to be advanced in the technology they planned to use, and a full 65% viewed themselves as beginners.

Relevant conclusions:

- School and institution-based access to IT hardware and software has been significantly improved in the past five years, although there are still significant qualitative differences in the quality of classroom applications.
- A home-based “digital divide” still exists, and hampers Latinos in the development of basic and advanced computer and information literacy skills.
- The most critical issue in K-12 school and higher education learning technology use is the availability of people with skills and background to develop and implement those applications.

Key Issues: Learning

In order to create equitable access to important learning technologies among underserved Latino populations several issues must be addressed. To a significant degree, these issues express themselves in both K-12 and postsecondary settings, although with quite different contexts and participants.

Raising Standards for Computer and Information Literacy. Developing a high degree of computer and information literacy among staff members is a priority because technology cannot be fully utilized unless there is qualified staff available to train and assist users. Increasingly, K-12 schools are creating standards that set minimum technology skill requirements for new teachers while also working to upgrade the computer and information literacy of all staff through ongoing training. In the postsecondary context, standards and guidelines are also being developed for distributed learning and information literacy. To the extent that such activities set rational directions and provide useful practices, they should be encouraged.

Parental Awareness of IT and Education. Because of lingering physical access problems in the home, and backgrounds of lower educational attainment and limited exposure to IT in the workplace, parents of disadvantaged and minority students are less likely to understand the linkages between IT, education and opportunities for their children. These issues are rarely addressed, as such, in school conferences, events or programs. There is a huge and rewarding opportunity for information outreach programs focused on parents.

There is also enough general knowledge about what works in terms of parent involvement programs to provide early action templates.

Staff Turnover. The overall level of staff computer and information literacy can be affected by staff turnover. Loss of experienced staff can have severe repercussions for a technology program, depending upon the nature of the position vacated. The level of impact depends on the degree of technology expertise lost, how hard it is to regain, and the size of the organization. For programs in the early stages of integrating technology into their curriculum, the loss of key staff, such as a chief information officer, networking or computer staff, technically sophisticated librarians, or technology coordinator, can dramatically slow the process.

Staff Training in Technology Integration. Many teacher-training programs at universities are now requiring courses on how to integrate technology into the curriculum, including some Hispanic-Serving Institutions (HSIs). The impact of this type of training may be evident in recent NCES data which indicates that 43% of teachers with less than three years of classroom experience--but with more extensive exposure in their teacher training to instructional applications of technology--use network technologies to create instructional materials compared to only 35% of teachers with 20 or more years of experience (Rowland, 2000). However, such training is not mandatory in all states and even where it is available to new teachers it does nothing to eliminate the disparity in technology use between new and “old” staff. Professional development, however, does seem to impact whether a teacher uses technology in the classroom. For example, 41% of teachers who received no professional development used technology for classroom instruction compared to 82% of teachers who received more than 32 hours of professional development (Rowland, 2000). Such training requires a time commitment from staff as well as financial support from administration, and frequently enhancements to departments, schools or colleges of education at colleges and universities.

How technology is specifically integrated into the curricula of a K-12 or college program depends on program goals and objectives. Technology integration may include teaching keyboarding, spreadsheet and

multimedia production, or computer and network hardware technology skills in a vocational program geared towards job training, or it may mean developing learner-centered or project-based learning to incorporate research, writing, creative and critical thinking skills in a classroom. The scope and quality of staff training varies widely across the country and there have been few if any systematic efforts to define and identify best practices and exemplary programs.

Technology Planning. Developing a technology plan or strategy appears to help the process of integrating technology into curricula K-12 schools or colleges and universities. While a program may succeed without a clearly articulated plan in place, an organization that lacks a technology plan risks encountering major and expensive diversions that can jeopardize its success. Whether part of a larger strategic plan or a stand-alone document, a technology plan establishes implementation procedures, explains the decision-making process, sets future goals and clarifies the intended uses of technology.

Action Opportunities for Improving Learning with Technology

As suggested above, the “gap” in effective use of learning technology through distributed learning applications is a combination of: (1) physical access to hardware, software and high speed Internet access; and (2) more knowledge, shared among more people, in how to effectively harness the unique potential of IT to educational applications. The first issue is gradually being acted upon as a result of public policies and incentives, greater competition and national market penetration, as well as by a steady decline in the real cost of the technologies.

The most prominent issues--and associated opportunities--concern the people part of the equation. Not the technology per se, but the ability to harness it to educational goals and objectives in ways that are meaningful and appropriate for Latino learners. There are many opportunities for corporations and foundations to make a difference in the national skills set, as well as in the IT competencies of educational leadership, as follows:

Focus Post-Secondary Attention on Hispanic-Serving Institutions (HSIs). Approximately half of college-attending Latinos go to school in HSIs. These HSIs are also major producers of the K-20 teachers going into the Latino community. To the extent that the community is to partake of the opportunities afforded by distributed learning, including distance learning, and the pre- and in-service teacher training, these are likely to be delivered by HSIs. A variety of capacity-enhancing initiatives, including the enhancement of technology infrastructure and the integration of technology across the curriculum, could be undertaken among these institutions, as well as their participation in activities mentioned below.

Benchmark Performance and Practices in the Use of Learning Technology. The associated fields of classroom educational technology and distance learning, which we have referred to here as distributed learning, are rife with program “innovation” that is neither channeled nor challenged. For any given substantive (e.g., math) or setting (e.g., K-12, undergraduate education or graduate training) application, there are dozens or hundreds of programs that are presumably innovative and effective. There is a strong need for national benchmarking research programs that can: (1) identify programs, policies, and practices that are truly exemplary; (2) document and describe those exemplary approaches such that others can replicate the experience; and (3) aggressively disseminate those exemplars to other Latino-serving organizations.

As an example, Achieve, Inc. is an independent, bipartisan, nonprofit organization that helps states raise academic standards, measure performance against those standards, establish clear accountability for results and strengthen public confidence in the education system. Achieve, Inc. was founded following the 1996 National Education Summit that IBM hosted to address a growing concern about the quality of education in America’s schools.

Concentrate on Faculty and Staff Development. The key to effective utilization of technology in either K-12 or colleges and universities seems to be in staff and faculty development activities. These run the gamut from special emphases in teacher training curriculum,

intensive summer workshops and institutes, in-service training, individual and group faculty support, and peer-to-peer mentoring. A very intensive, longitudinal effort (using benchmarking and other evaluation research approaches) needs to be focused on developing programs, and sorting out these programs among those that work well and those that do not. Collaborations among colleges and universities, particularly HSIs, and Hispanic-serving school districts need to be supported to enhance pre- and in-service teacher training.

Foster the Development of Standards and Rational Accreditation. One long-standing mode of defining the range of acceptable practice in the educational arena has been the use of standards and an accreditation processes. These approaches are already being used in teacher training programs focused on technology, and in distributed learning standards. An accelerated, thoughtful increase could increase the effective use of technology in education.

Launch Educational Outreach Programs to Latino Parents. A large scale information outreach program should be launched to inform parents about the role that technology plays in education, the links between IT skills and job opportunities for their children, and the long-term benefits of educational attainment.

Foster the Development of Technology Strategic Planning. For the effective integration of technology into a learner-centered curriculum, or the administration of a school, a district or a college or university, strategic planning of technology to meet programmatic goals is essential. Efforts to enhance strategic planning at K-12 schools and colleges and universities, involving the faculty as well as administrators and other staff, need to be supported for technology to have an enduring and significant impact on the education of Latinos, and other students. IBM's Project FIRST (Fostering Instructional Reform through Service and Technology) coordinates and develops partnerships among participating Local Education Funds, schools, communities, and local technology corporations to increase their understanding and use of technology, while enhancing teaching and learning.

Maintain Support for Applied Research on Teaching and Learning Technologies. The dearth of research on Latinos and the application of teaching and learning technologies speaks to the need for research to better understand these technologies and appropriately deploy them for the enhancement of Latino learning and educational attainment. This is particularly true in higher education, but much of the work in K-12 schools does not take ethnic and cultural variables into consideration, let alone gender and ethnic interaction effects, and have many of the drawbacks almost inherent in research in natural settings.

IV. Technology Jobs for Latinos

It is abundantly clear that national economic growth over the past few years has been fueled in large part by advances and applications in information and communications technology (Atkinson, Court & Ward, 1999). The sector has also been hampered by an uncertain supply of appropriately educated and skilled personnel. According to information technology industry estimates, over 425,000 of 900,000 new IT jobs will go unfulfilled in 2001 (ITAA, 2001). The five fastest growing careers are in computer-related fields, and they offer earning potential that is significantly above average (Fullerton, 1999).

What are IT Jobs and Where are They?

The definitions of an IT job are changing. Two general approaches have been utilized. One has identified an IT job existing in an industry that primarily sells information and communication products. These might include industries such as major telecommunications companies, software producers, computer manufacturers, and companies that provide computer services. A second, somewhat overlapping approach focuses more on the skill sets involved in particular jobs, rather than the end products produced by a company. By this definition an industry that is involved in non-IT products or services (e.g., toasters, steel wire, graphical design), but uses information and communication skills and technologies in their production, development or delivery might have many IT jobs.

A recent study trying to identify "high tech" metropolitan areas (Markusen, Chapple, Schuck, Yamamoto & Yu, 2001) included a more liberal definition of technology industries to include the service sector (e.g., financial services, insurance). The findings surprisingly place Chicago in the top tier of technology-based regional economies, and the overall ranking has much more of a frost-belt flavor--with a greater representation of older manufacturing centers--than do past studies of this type. As some of the core IT industries (e.g., computers, telecommunications, and electronics) become "mature," they will be overshadowed by a host

of unforeseeable applications of those technologies in new markets and settings.

One implication of IT pervasiveness is that there will be subtle, cumulative, and continuous changes in IT skill sets. To the extent that IT becomes an integral part of other technological domains, those who take the resultant jobs will be expected to master multidisciplinary skills and knowledge. The biotech revolution is illustrative. While much popular attention has been focused on the Human Genome Project, and its implications for preventive medicine and drug development, not widely known is that much of the critical research will involve information-processing on a grand scale, involving new hardware and software technologies.

This phenomenon of IT technologies migrating into an increasing variety of industries and the associated changes in requisite skill sets, also has implications for education, training, and the "pipeline" into IT jobs. For example, the traditional educational route has passed through coursework and/or degrees in computer science, systems analysis, electrical engineering or allied fields. To some extent this has been a deterrent to many individuals with the cognitive skills and interests to succeed in IT fields, but who are nonetheless turned off by the culture of these disciplines. An extensive literature search suggests that women and minorities are turned off by the "geek" world (Margolis, Fisher & Miller, 1999) that has been historically dominated by white or Asian males.

Some of the implications of these observations for Latinos and IT jobs include the following:

- Despite recent setbacks in some IT industries, there are a large number of jobs that demand network skills and knowledge, and the long-term growth prospects are bullish.
- IT jobs offer high earning potential.
- IT jobs will be geographically dispersed, with opportunities emerging anywhere, including where there are large concentrations of Latinos.
- Most IT jobs and job growth will be in industries that historically have not been considered as IT-intensive (e.g., financial services, manufacturing). In the strictest sense, these are "IT-enabled" jobs, as opposed to hard-core IT positions. Nonetheless, most of them pay well and create substantial opportunities.

- IT job skills will increasingly be merged with knowledge and skills from other disciplines and fields, which represent prime applications of the core technologies. This implies that the locus of IT skills development -- and associated jobs -- will be increasingly found outside of computer science and engineering fields per se.

The Challenge: The Failing Human Resource Pipeline

Discouraging statistics could be cited at great length, but perhaps an appropriate summary of the problem can be derived from the President's Information Technology Advisory Committee (PITAC, 1999) report on an IT research agenda:

There is, without any doubt, a vast untapped talent pool in the United States among women and minorities, currently under-represented in engineering and information sciences. African-Americans, Latinos, and Native Americans constitute a fourth of the total U.S. workforce. Yet members of these minorities collectively comprise only 6.7 percent of the U.S. computer and information science labor force (all degree levels), 5.9 percent of the engineering workforce, 1.7 percent of the U.S. computer science faculty, and 4.9 percent of the engineering faculty. Women participate in both computer science and engineering at low rates for all degrees and subsequently in academia and industry.

Key Issues: Employment

The problem of Latino preparation for and participation in the rapidly growing IT sector is inseparable from larger, chronic issues of education and training. These issues are obvious in settings that range from pre-school through postsecondary education, and are at the core of most of the problems that have hampered Latino social and economic advancement. Some of the most critical of those issues include the following:

Latino Family Dynamics. The work of researchers such as Eccles (1994); Eccles, Wigfield & Schiefele (1997); and Margolis, Fisher & Miller (1999), has demonstrated the importance of personal values, attitudes and expectations, and how many of these are grounded in cultural values and family patterns. Latino

families (Shorris, 1992) possess a strong centripetal force; that is, they tend to stay close together and in the same location. The pull of family may be observed in the tenacity of beliefs as well as enduring role images for Hispanic males and females. At a basic level of belief and values, the men's role is to work to support large families; women stay home to tend to the children. Bureau of Labor Statistics figures show that while Hispanic males have the highest worker participation rate in all U.S. industries by race and sex, Hispanic women have the lowest participation rate (Fullerton, 1999).

Jobs in information technology may not be coincident with the traditional images of what a man or woman may do. As heard from one Ph.D.-level Latina informant: "So you can write code, but can you make a tortilla from scratch?" And what a young person from a Latino family does reflects upon the family. Thus, given the power and attraction of the family, Latino students may be reluctant to go away to college or to move away from the neighborhood to take a job. They are also likely to leave college if they do not find cultural support from peers, mentors, and Latin studies programs aimed at retention (Tapia & Lanius, 2000). There are, of course, countervailing forces such as scholarship programs that encourage bright students to excel in school, a natural consequence of which is leaving home. Nonetheless, the degree to which primary relationships keep students bound to home and neighborhood versus moving away to attend higher education and participate in IT careers remains a large unknown.

Immigration and Social Integration. Virtually every indicator of educational or vocational accomplishment within the Latino community is related to whether or not individuals come from first generation immigrant families or earlier periods of social integration. In a recent large-scale study conducted by the Tomás Rivera Policy Institute, it is clear that immigrant Latino families experience reduced educational outcomes, despite major parallel gains by U.S.-born Latinos (Bean, Trejo, Capps & Tyler, 2001). The pattern of immigration is likely to be a major factor in the school dropout problem, particularly given the relatively high share of immigrants among Hispanic adults, which is increasing.

Language skills are an important component of these phenomena (Rumberger & Larson, 1998), and there are differences across immigrant groups. We expect that this factor will be reflected in educational and vocational aspirations at the close of middle school, in course-taking behavior during high school, in the availability of home-based computers, and in access to IT role models in the community. In many immigrant families there is insufficient knowledge about the nature of the U.S knowledge economy, the link between education and job opportunities, and the absolute necessity that children reach the highest levels of educational attainment that is possible. In conclusion:

- Latino immigration patterns may be exacerbating problems in the IT workforce pipelines, particularly to the extent that it introduces students into school systems with language deficits and limited parental models of academic achievement.

Role Models, Mentoring and Access to Informal Networks. Formal educational accomplishments are only one aspect of being directed to and succeeding in IT careers. To succeed, and make appropriate educational choices, it is critical that middle and high school students avail themselves of social capital, often mediated by their parents and significant institutional agents (Stanton-Salazar & Dornbusch, 1995). There is also likely to be a somewhat different level of involvement of peer role models in the Latino community. In many non-Latino communities, IT is not only visible, but also pervasive. It is reflected in the presence in the home of computers and high speed Internet access, and in the prominent use in of IT metaphors and code words in casual conversation. It is inherently easier for young, middle class non-Hispanic whites and/or Asians to become connected to the IT-related social capital of their communities than it is for Latinos.

Mentoring and informal exposure to IT role models can perform a critical function for Latino youth. It can raise awareness about career paths and employment opportunities in a wide variety of IT-enabled jobs. If acquiring IT skills in school can be seen as instrumental to a more attractive future life, it will likely increase the perseverance of student in school and in IT.

During the post-secondary years, formal internship or co-op programs can enhance mentorship and

networking, but in their absence relatively fewer women and/or minorities have comparable resources. Tapia & Lanius (2000) studied the retention rates of Hispanic American and African American undergraduate students at Rice University. Retention seemed to be a function of the degree of interactions with other students (particularly other minorities), the Program Director, and an identifiable mentor.

Even after women and minorities have gained entrance to the IT industry, problems still often exist. A recent survey of industry executives (Bruno, 1997) found that 69% of respondents had company diversity policies in place to encourage the hiring of women and minorities, but only 14% and 25% had programs to help further the careers of women and minorities, respectively. The following conclusions seem appropriate:

- Latino youth have relatively weak or underdeveloped networks of IT role models in their communities.
- Latino youth tend to have less involvement in IT mentoring and informal networking through their educational experiences.

Early Childhood Education. It may seem premature to discuss pre-school in the context of information technology jobs, but the data are clear on two points: (1) early learning experiences, at home and away, are critical for cognitive development and insuring subsequent success in K-12; and (2) Latinos are less likely to partake of high quality pre-school education. This occurs in the context of the rich family orientation of Latino culture. However, to the extent that economic necessity dictates that both parents enter the workforce, and with the potential absence of extended family support among recently arrived immigrants, nuclear families may be more reliant on extra-familial resources such as day care centers.

Unfortunately, there is also overwhelming evidence that Latinos do not avail themselves of preschool programs (ERIC, 2001). Only 20% of Latino children under the age of five are enrolled in early childhood education, compared to 44% of African Americans and 42% of whites. Despite the fact that over a third of Latino children live in poverty, only 26% are enrolled in Head Start. Only 65% of Latino children three to five years old are read to, compared to 90% of whites and 75% of African Americans.

On the plus side, there is evidence (The College Board, 1999) that a number of day care models seem to produce long-term, substantial academic gains. For example, IBM's KidSmart Early Learning Program provides low-income preschool children with experience with technology using educational software and specially designed computers in nonprofit daycare centers. In New York City, the KidSmart program placed Young Explorer computers in the Grand Street Settlement on the Lower East Side, a mixed day care and Head Start program. The center serves 180 children; 85% are Latino, and the substantial majority are low income, with almost half qualifying for Head Start. The KidSmart program is also being used in Latin America using early learning software in Spanish (IBM, 2001). A conclusion is:

- Weaknesses in the educational pipeline for Latinos begin at the preschool level, with profound differences in access to and utilization of educational experiences.

Latino Dropouts. Latino children are significantly more likely to leave school early, most of them by the ninth grade. This is arguably the most critical IT "pipeline" problem. At 57.5% in 1996, Latinos have the lowest high school completion rate of any major ethnic group. This compares to a rate of 82.3% for whites, 75.3% for African Americans, and 70.0% for Native Americans (Gandara & Maxwell-Jolly, 1999). This problem is also exacerbated by the fraction of the Latino population who are immigrants, some of whom never enter the formal school system in this country and who, on average, are likely to have fewer years of schooling in their country of origin.

For example, according to data analysis by the College Board (Vernez & Krop, 1999), of the adult population aged 25 or more in 1990, 21.1% were not college graduates. For Latinos of Mexican descent the figure was 51.0%, and 36.7% for all other Hispanics. These figures are expected to drop to 39.1% and 28.9% respectively by the year 2015. However, over the next few years the dropout rate for other racial and ethnic groups will decline more sharply, and by 2015 the likelihood of adults of Mexican descent having less than 12 years of education will be four times more likely than for non-Hispanic whites (compared to a 3 to 1 ratio in 1990). The recent resurgence in educational testing may exacerbate the Latino dropout problem as well (Beatty, et.al., 2001).

It should be pointed out that despite the somewhat discouraging nature of these summary statistics, there are hopeful signs that this problem can be meaningfully addressed. For example, there are a number of early intervention programs targeted toward Latino youth at risk--as well as other minorities--that are producing significant and replicable results (NPEC, 2001). While further program development work is needed, even greater effort need to be devoted to disseminating "what works" to schools around the country.

Relevant conclusions are:

- In terms of sheer magnitude, the dropout problem is the most significant contributor to a weak flow of ICT-qualified young Latinos.
- The dropout problem is exacerbated by projected immigration patterns.

Educational Attainment and Achievement. Even for those Latino students who remain through high school, there are *de facto* dropouts from the IT workforce pipeline because of decrements in educational attainment or achievement. There are several aspects of this phenomenon. One is the tendency of Latino students to get poorer grades, to get "tracked" into less challenging (and qualifying) curricula, and most critical for this discussion, to not take computer science coursework and to opt out of higher level math and science coursework. For example, in data reported by the College Board, Hispanics tended to be outscored by a multiple of 3 to 4 by whites and Asians in the percentage of 12th grade students scoring at the proficient or advanced levels in the reading, math and science NAEP tests (The College Board, 1999). In addition, NCES data show that, as recently as 1994, about 62% of non-Hispanic white students and 67% of Asian/Pacific Islander students take Algebra II, compared to 51% of Hispanics (NCES 1997). The importance of these data is underscored given that one of the most powerful predictors of college graduation is the intensity of the high school curriculum (Adelman, 1999).

Some of these differences may be a function of structural discrimination. A recent study by the Tomás Rivera Policy Institute (Pachon, Federman & Castillo, 2000) found that, controlling for size, the availability of Advanced Placement (AP) courses in California high

schools was negatively related to both minority enrollment and having a large proportion of low income students.

A second aspect of educational attainment involves postsecondary education. On average, a much smaller percentage of Latinos obtain four-year college degrees in any field. For example, in 1996 the National Center for Educational Statistics (NCES, 1997) reported that Latinos accounted for 5.8% of enrollment at four-year institutions, but 11.7% of the enrollment at two-year schools. The latter figure is much closer to their representation in the population at large. These trends are exacerbated for Latino women. In 1998, NCES reported that 17.1% of Latino women earned a Bachelor's degree compared to 36.1% for non-Hispanic white females.

To the extent that Latinos get involved in IT programs and degrees, and since their most likely postsecondary destination is the two-year institution, they are likely to be employed at lower levels of professional responsibility. This is illustrated by a recent NCES report (Zucker & Dawson, 2001) looking at 1992 earnings data for 1982 high school graduates. Among all respondents, those who had achieved a Bachelor's degree or higher in computer or information science ranked second in earnings of 19 majors. However, for those who had achieved an Associate's degree in computer and information sciences, their earnings ranked ninth of 12 majors. Unfortunately, only 8.3% of Latinos graduating from high school in 1982 achieved a Bachelor's degree compared to 21.4% for whites.

Even for those Latinos who matriculate at four-year colleges and universities, their level of achievement is lower than might be expected. This is most reflected in grades achieved, courses taken, and the extent of preparation for higher levels of education. This is, in effect, an "overprediction" phenomenon (Bowen & Bock, 1998). That is, minorities tend to do less well than might be expected from test scores. One result is that a smaller fraction of Latinos go on to graduate school, and into higher levels of IT-related credentials. There are very few Latino professors or senior scientists and technologists in industry. Therefore, we have reached the following conclusions:

- At every level of the kindergarten through graduate school pipeline, Latinos display a lower level of attainment (e.g., percent completing college) and achievement (e.g., high school GPA, ACT scores).
- At the postsecondary level, Latinos tend to migrate to local community colleges rather than colleges and universities away from home.

The Special Role of the Community College. For several reasons, a local community college often becomes the postsecondary institution of choice for the Latino family. For one, the significantly lower cost for a community college education makes it particularly appealing. Second, that community colleges are local makes them more compatible with the stay-at-home tendencies of the Latino family. Third, community college programs--degree-oriented or not--have tended to emphasize practical utility and linkages to jobs.

Community colleges also have organizational flexibilities that are very appropriate given the nature of IT industry. They can more easily provide a range of education and training offerings than can other postsecondary institutions. These include: two-year degree programs; programs focused on transfer to a four-year institution; contract training for individual companies; and certificate programs that represent a bundle of related coursework around a central IT theme (e.g., "Global Commerce").

Given their flexibility, community colleges have often been more responsive to local and national trends and needs. The growth of IT jobs has been more prominent outside of the mainline IT industries, and often around context-specific needs. Curricula need to be responsive to this fact. For example, Macomb Community College in Michigan has been offering course work on simulation software and applications, but doing it in the context of their manufacturing curriculum.

One of the most important issues regarding community college-based education and training is the "portability" of the skills for participants. For example, in addition to providing contract training for employers, the community colleges are also providing a venue for certification programs tied to specific vendor products. Companies such as Microsoft, Cisco, and Oracle have been particularly active. While the immediate outcome for a student is

greater employability through increased skills, there is a debate about whether such skills are marketable in work settings with different technology platforms. In effect, a new system of credentials has developed, largely driven by private interests that may or may not be in balance (Adelman, 2000) with long-term public interests, such as a mobile, multi-skilled workforce.

A related issue is the movement of community college degree recipients (or participants in targeted certificate programs) into higher levels of education. In a sense, this is a conflict between more generalized skills and those that are more specific and immediately applicable. According to data from the American Association of Community Colleges (AACC) the production of two-year degrees in computer science is still relatively low. Since this is a highly transferable degree, the implications for IT workforce may be significant. In conclusion:

- Community colleges are a key education and training providers for Latinos for a variety of economic, curricular and location reasons.
- There are lingering issues concerning the transferability, generality and long-term career potential of some community college programs.
- Because of their operating and curricular flexibilities, community colleges may be able to take the lead in providing a menu of complementary education and training programs--some industry-specific, some technology or vendor-specific, and others addressing more general skills and knowledge.

Fixing the Innovation Engine. It would be incorrect, however, to argue that there have not been countless attempts to address and remedy the problems described above. In fact, there is a growing research literature about educational programs that demonstrably work for Latinos, and that span the gamut from classroom teaching strategies to new ways of making parent-school interaction more of a partnership rather than an episode (Fashola , Slavin, Calderon & Duran, 1997; Fashola & Slavin, 1997; Reyes, Scribner & Scribner, 1999). Moreover, as state and local policy makers wake up to the fact that a well-educated Latino population is essential for the future well being of the society and the economy, we can expect to see increasing investments in the development and sharpening of program innovation.

If we are well along the way in understanding what works to solve those problems and strengthen educational delivery systems, why are we not making faster progress in closing the gap? The problem is that the system for getting innovations into the classroom is not working as well as it might. Despite what we know about the dissemination, adoption, and implementation of new innovations (Rogers & Shoemaker, 1980; Tornatzky & Fleischer, 1990), there seems to be no integrated system to support the process of change in the world of education.

Over the last 20 years, a small body of research has emerged on the problems of translating ideas into action, and the findings illustrate three fundamental points. First, innovation implementation is an organizational challenge that is by no means unique to schools. Numerous organizations fall prey to the “knowing-doing gap”; they fail to implement the practices that are known to be most effective. Second, a variety of factors may influence innovation implementation, including culture, knowledge exchange networks, and openness to experience. Third, the factors that facilitate and impair innovation implementation occur at different levels: the federal government, state governments, districts, schools, and teachers. For example, the federal Department of Education’s National Diffusion Network program for many years disseminated useful educational practices. Similarly, state educational agencies as well as local school districts typically have programs, structures and policies intended to accelerate the process of improving educational attainment.

What is not clear, however, is whether, or where, an integrated system of innovation actually exists, and how this might affect the adoption of proven programs, policies, and practices affecting Latino educational attainment and achievement. Nonetheless, there are several well-defined models of how the processes of innovation adoption and implementation should work, and perhaps the current systems can be improved.

Two conclusions summarize this section:

- A growing number of validated programs increase educational attainment and achievement for Latinos, and also increase the likelihood of successfully navigating through the IT pipeline.

- There is little evidence that schools and school systems pay much attention to this innovation stockpile, and there is an opportunity to create new “innovation systems” to accelerate the use of proven practices and programs.

Action Opportunities for Technology and the Workforce

The problems and issues described above are immense, since they involve literally millions of people, thousands of school organizations, and hundreds of Latino communities across the country. Nonetheless, there are several approaches that the foundation and corporate communities can pursue to effectively change the IT pipeline for Latinos, as follows:

Use Benchmarking to Empirically Identify Best Practices. Benchmarking involves a simple discipline that includes: (1) identifying domains of organizational activity from which one can derive indicators of, or contributors to, a robust local economy; (2) gathering performance data across a large number of communities, in order to identify those that are exemplary in their performance; and (3) identifying “best practices” and policies used in those communities that might be emulated by their peers (Tornatzky, 2000).

Launch National Programs to Aggressively Disseminate Best Practices. As exemplary programs that meet the IT workforce needs of Latinos are uncovered, the challenge then becomes putting those programs into operation in the nation’s K-12 and postsecondary institutions. No federal agency does this very well, and there is a huge opportunity for a consortium of prestigious foundations and companies to take the lead. They will find some allies among the educational infrastructure (i.e., The Center for Research on the Education of Students Placed at Risk), and such an approach has the potential for national impact. For example, a recent effort (Casson et al., 1997) documented practices in implementing educational technologies and disseminated the resultant “cookbook” to over 25,000 schools.

Focus on the Dropout Problem. One of the most significant factors in fixing the IT pipeline is the problem of students dropping out of school. It also

should be understood that dropping out is both a symptom and a cause. It is a symptom of the lack of successful experiences in the early grades, and thus an indictment of many features of the educational experience for Latinos. For example, many Latino youngsters have not been schooled--either formally or experientially--on the relationship between educational attainment, computer competencies, and future remunerative career paths. Nonetheless, a student who has dropped out is unlikely to return and finish secondary school, much less college matriculation.

Better Understand the Community College Role. Community colleges are a popular postsecondary destination for Latinos. They provide an open, accessible and inexpensive venue in which a variety of IT-relevant educational experiences are offered or brokered. It is not clear, however, in what ways the community college experience helps or hinders the long term IT career aspirations of Latinos. This demands research into student career outcomes, and benchmarking of exemplary programs where those outcomes are enhanced.

Develop IT Leadership in Schooling. The essence of an industry-responsive, nimble approach to IT workforce issues is several fold: (1) understand the industry; (2) understand the technology; (3) understand the changing patterns of jobs and skill needs; and (4) craft curriculum accordingly and quickly. There are few individuals in either K-12 or postsecondary education who have that mix of talents. Moreover, the instructional staff in those institutions for the year 2005 is already in place, with many positions going unfilled.

What are needed are national programs to enhance the skills and knowledge of educators in ways that are relevant to the IT workforce pipeline. At the K-12 level, this might involve summer-long IT Academies for teachers and administrators, hosted by distinguished universities, but with a heavy role in curriculum development played by the IT industry. A central component would focus on “best practices” in enhancing students’ academic performance and their ability to use computers. At the postsecondary level, there could be parallel Academies focused on community college and college faculty. Again, the focus would be on weaving in the utilization of computation in the context of content courses. IT skills and applications are becoming pervasive throughout the economy, yet this is not widely reflected in the content or process of postsecondary education.

V. Who Owns the Action Agenda?

In the three major sections of this report, over 20 action opportunities have been identified. No single entity or organization could hope to address all of those calls to change. Nonetheless, it is worthwhile to suggest which entities might “own” which action items towards implementation.

IT Companies

In a market-based economy, any company has a primary obligation to pursue its business interests and strategy. However, a more expansive conception of business interest would put IT companies in a more central role in implementing many of the action opportunities discussed in this report. For example, many of the educational reform recommendations herein would in the long run increase the supply of IT human resources. More generally, IT companies should increase the nature and scope of their partnerships with educational institutions, at every level of the educational system. Similarly, through its philanthropic and public interest functions, IT companies could play an important and credible role in community education and awareness building. Existing and newly established IT companies, both large and small, play a prominent role in the development of Spanish-language websites, reliable translation software, and new educational hardware and software.

Federal Education Agencies

Funding for education is a local and state endeavor; however, there is a role that can be played by federal agencies with an educational mandate, primarily the U.S. Department of Education and the National Science Foundation. For example, this report has called for a more systematic and aggressive approach to: (1) identifying “best practices” in educational programs and the application of educational technology; and (2) disseminating those lessons and fostering local replications. This is a natural and logical role for USDOE and NSF, and one that has fallen somewhat by the wayside in recent years. Increased funding and new leadership is needed, as does a particular “best practice” focus on issues of Latino education and IT use.

Other agenda items that might be assumed by these agencies include a greater emphasis on faculty and staff development related to IT, fostering the development and use of standards in using learning technology, and developing IT leadership in school settings. Most educational reform efforts are likely to improve the IT pipeline issues at a general level; however, there are special challenges within the Latino community that need special attention, such as the dropout problem.

Federal IT-Related Agencies. The IT agenda does not reside in any single federal agency, but disparate components (e.g., R&D, community planning projects) are scattered across several agencies, or sub-units within those agencies. As suggested in this report, there is a continuing need for IT planning and awareness building in Latino communities. Similarly, there are needs for new applications of educational technologies, Spanish language software and Internet presence, and continuing monitoring of IT workforce issues.

Higher Education. Colleges and universities have played a historically important role in many of the action recommendations embedded in this report. They are the producers of teachers and educational leaders that serve Latino communities. Many are involved in the creation of new, novel educational programs (“best practices”) and should continue to be involved. Unfortunately, not enough people in higher education are involved in the systematic dissemination of best practices, either related to IT or more generally. A number of colleges and universities are involved in community development projects, and should become involved likewise in the community education and development activities recommended in this report.

State and Local Education Agencies. Several states, and even more metropolitan areas, have a high concentration of Latino residents. As such, many of the issues highlighted in this report are part of the daily policy agenda for states and local units of government. In fact, most of the action recommendations in this report will be implemented at that level.

Private Foundations. A number of major private foundations have a longstanding interest in Latino issues along with a growing interest in the knowledge economy. Given the flexibility of the foundation community, they could support many of the action opportunities described here. To the extent that such initiatives would seemingly overlap the work of federal agencies (e.g., in the support of innovative new IT-related programs), they can act as a partner of, or model for, agency programs. For example, foundations could support IT leadership development efforts in schools and communities, nurture educational reform efforts that are related to IT and IT workforce issues, and support the greater and more effective use of IT in educational delivery. Many foundations already pursue a giving agenda in these areas; nonetheless, some of the action recommendations in this paper may attract their further attention.

Community-Based Organizations. Community-based organizations tend to be very responsive to the needs of the community they serve, and they often support the more marginalized communities. Moreover, Latinos have demonstrated a willingness to turn to CBOs for technology skills and usage. As such, partnerships that include CBOs are likely to have a greater impact on Latinos and their families.

VI. Conclusion

The digital divide is only nominally about access to the hardware and software, as opposed to meeting the educational, cultural, creative and business needs of Latino users. It is more broadly about the construction of knowledge, both by individuals and by communities, and the applications of technology in meeting diverse needs and goals. Network technologies do not solve problems in and of themselves; however, they are a means by which those needs and goals can be met. The Internet offers an opportunity to aggregate the interests of many people separated by geography, increase their social capital by communicating with each other and sharing information on the way to building a political dialogue about which issues and spokespersons to support, and creating a robust business culture.

Access to network technologies and skills in Latino communities is essential, as economic opportunities increasingly require digital literacy. Networked technologies are generally accepted as necessary tools of everyday life, and it is important to respond to concerns about successfully integrating them into Latino community life at all age levels. The sooner these communities are introduced to the culture of technology with all the benefits and problems that come with it, the sooner technology begins to penetrate into the community and it can be used to effectuate change.

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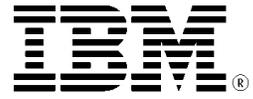
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