



University of Pennsylvania
ScholarlyCommons

Departmental Papers (City and Regional Planning)

Department of City and Regional Planning

January 2004

Beyond the First Job: Career Ladder Initiatives in Information Technology Industries

Laura Wolf-Powers

University of Pennsylvania, lwolfpowers@gc.cuny.edu

Follow this and additional works at: http://repository.upenn.edu/cplan_papers

Wolf-Powers, Laura, "Beyond the First Job: Career Ladder Initiatives in Information Technology Industries" (2004). *Departmental Papers (City and Regional Planning)*. 44.

http://repository.upenn.edu/cplan_papers/44

Reprinted from *Communities and Workforce Development*, Edwin Melendez, ed., (Kalamazoo, MI: W.E. Upjohn Institute, 2004), Chapter 8, pages 253-290.

This paper is posted at ScholarlyCommons. http://repository.upenn.edu/cplan_papers/44

For more information, please contact libraryrepository@pobox.upenn.edu.

Beyond the First Job: Career Ladder Initiatives in Information Technology Industries

Abstract

In the past two decades, major growth drivers in the U.S. economy have included computers and software, information "content" such as broadcast entertainment, and advanced services and manufacturing that rely on information technology. This is particularly true in leading metropolitan agglomerations, where synergies between the global reach of communications systems and the local intensity of face-to-face communication are crucial to getting the most out of talent, entrepreneurial creativity, and productivity (Graham and Marvin 1996; Hall 1999; Sassen 2001). The polarity between information haves and have-nots in the most dynamic urban centers is stark, however. The digital divide creates or reinforces cultural distance among people who are geographically within a few miles of one another (Mitchell 1999; Servon 2002). Significantly, since it has as much to do with earning power as with access to information, the divide also reinforces income disparities among urbanites (Schön 1999; Hall 1999; National Telecommunications and Information Administration 2000).

Comments

Reprinted from *Communities and Workforce Development*, Edwin Melendez, ed., (Kalamazoo, MI: W.E. Upjohn Institute, 2004), Chapter 8, pages 253-290.

Beyond the First Job

Career Ladder Initiatives in Information Technology Industries

Laura Wolf-Powers
Pratt Institute

Wolf-Powers, Laura. 2004. "Beyond the First Job: Career Ladders in Information Technology Industries." In *Communities and Workforce Development*, Edwin Meléndez, ed. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, pp. 253–290.

© W.E. Upjohn Institute for Employment Research.

8

Beyond the First Job

Career Ladder Initiatives in Information Technology Industries

Laura Wolf-Powers
Pratt Institute

© W.E. Upjohn Institute for Employment Research

In the past two decades, major growth drivers in the U.S. economy have included computers and software, information “content” such as broadcast entertainment, and advanced services and manufacturing that rely on information technology. This is particularly true in leading metropolitan agglomerations, where synergies between the global reach of communications systems and the local intensity of face-to-face communication are crucial to getting the most out of talent, entrepreneurial creativity, and productivity (Graham and Marvin 1996; Hall 1999; Sassen 2001). The polarity between information haves and have-nots in the most dynamic urban centers is stark, however. The digital divide creates or reinforces cultural distance among people who are geographically within a few miles of one another (Mitchell 1999; Servon 2002). Significantly, since it has as much to do with earning power as with access to information, the divide also reinforces income disparities among urbanites (Schön 1999; Hall 1999; National Telecommunications and Information Administration 2000).

In response, policymakers have recently begun to experiment with initiatives that train low-income urbanites for jobs associated with maintaining communications infrastructure. The ability to understand complex information technology, and to translate that knowledge into hands-on use and maintenance of the infrastructure through which people exchange information, greatly increases the chances of a non-college-educated person’s earning a livable wage in today’s urban labor market (Chapple et al. 2000a). Jobs installing and maintaining voice

and data networks and their associated terminal equipment hold out the possibility of well-paying, blue-collar employment with advancement potential, much as semiskilled manufacturing jobs did in an earlier era.

Organizations such as the Bay Area Video Coalition in Oakland, California, and Per Scholas in the Bronx, New York, offer non-college-educated workers training in computer repair, data network configuration, web development and other skills (Chapple et al. 2000a). But the increase in information technology (IT) training options has done little to counter trends in corporate organization that limit mobility for non-college-educated employees in today's workplace. Changes in the contours of the employment relationship over the past several decades have affected employees at all levels of education and social status, but they have been particularly hard on the less educated. Employment practices that pose challenges for entry-level IT workers seeking security and mobility are varied. They include the following:

- Employer reliance on temporary workers or contractors rather than full-time employees
- The outsourcing of functions like data processing and computer support by large corporations¹
- The growing tendency of firms both large and small not to conduct in-house training or maintain internal job ladders by which non-college-educated workers might gain skills and income over time²

These practices depart from the internal labor market norms that characterized large industrial and service firms for much of the twentieth century. Bridges formerly prevalent between basic, entry-level positions and more advanced jobs in IT-intensive sectors such as banking, insurance, and telecommunications have diminished or disappeared. As a result, workers find not only that access to entry-level jobs requires previous training where it did not in the past, but also that, once employed, they must undertake further skill development on their own in order to advance.

This chapter examines three community-based initiatives whose sponsors have identified what might be termed the "IT career ladder problem" and tailored their workforce development strategies accordingly. The initiatives focus on helping their low-income, non-college-educated clients to win good entry-level jobs installing and maintaining

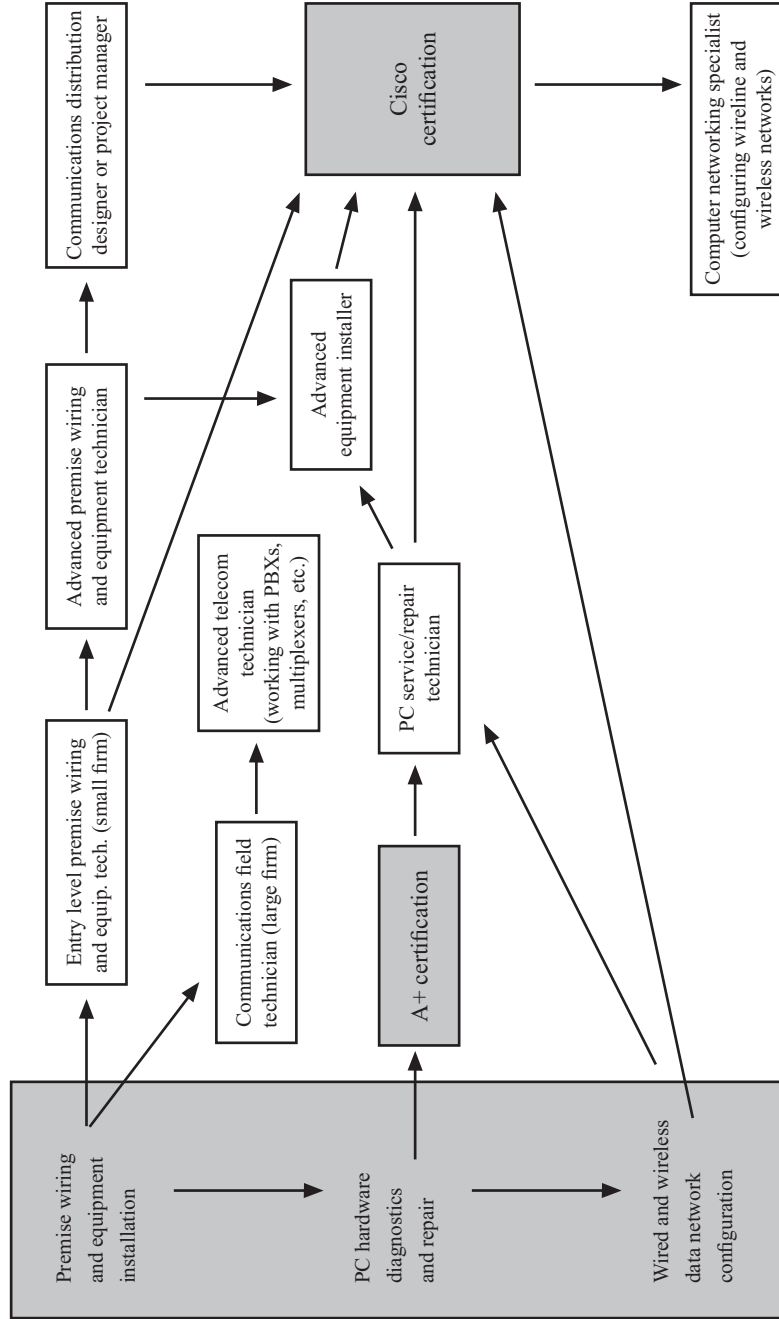
communications infrastructure. The jobs in which they strive to place their clients are good jobs in two senses. First, they pay family-supporting wages—cabling infrastructure installers typically make \$10–\$12 an hour. Second, there are relatively well-defined career ladders by which people in these entry-level jobs can move into higher-paying, higher-skilled positions over time (see Figure 8.1). All of the organizations profiled here are dedicated to enabling their clients to access the ongoing training necessary for career mobility in the information infrastructure industry.

The initiatives are also distinct in crucial ways. They are housed in different types of institutions. They rely on different sets of external collaborations to achieve a functioning mix of social services and client support, cutting-edge technical training, and the maintenance of ties to the demand side of the labor market. They have had different levels of success in terms of client placement and retention (though all have seen placement numbers drop during the recent downturn). Finally, each of the programs has a distinct relationship with the workforce development system emerging in its region under the 1998 Workforce Investment Act, or WIA.

STRUCTURE OF THE STUDY

Telecommunications services is a rich sector to study because unlike, for example, software or Internet commerce, it was once a bureaucratically organized, heavily regulated industry, virtually all of whose workers were represented by labor unions. Stable, predictable job and earnings progression was common, as was in-house training that enabled employees to qualify for advancement. As the industry has undergone gradual deregulation since the mid-1970s, and as technological advances such as fiber optics and new high-speed data-transmission protocols have blurred the distinctions between telecommunications, computing, and broadcast media, employment patterns have altered significantly. At the same time, as will be explained in further detail below, these very technological changes have opened career paths between traditional telecommunications technical work and IT occupations. And, despite the industry's general devolution, jobs all along the career continuum are relatively high-paying.

Figure 8.1 Career Pathways in Information Infrastructure



The three organizations profiled are located in Los Angeles and Oakland, California, and in Brooklyn, New York. The three focus regions (Los Angeles, San Francisco/San José, and New York City) were selected because they are identified in the literature as metropolitan agglomerations where high-speed bandwidth is densely concentrated to serve the needs of producer services and media firms with national and international markets, and where a concentration of Internet domain name registrations denotes the existence of technology-related enterprises that demand specialized telecommunications capacity (see Graham and Marvin 1996; Zook 2000). In these regions, entry-level opportunities in telecommunications and IT infrastructure maintenance are substantial and, if not (in the recent economic downturn) growing, stable enough to command the attention and curiosity of workforce development professionals.

INDUSTRY CONTEXT

The communications services industry in the United States in 2004 is the product of a series of judicial decisions and legislative acts which over the past thirty years have dismantled the AT&T-Bell telecommunications monopoly and created a convergence of telecommunications, computing, and broadcast media. In the late 1960s, AT&T, with its 22 regional Bell affiliates, was the sole provider of local and long distance telephone services. Western Electric, a Bell subsidiary, was the sole manufacturer of telecommunications network and customer premise equipment. The Bell System was the largest employer in the United States, with more than a million employees (Temin and Galambos 1987). Over several decades, federal judges, FCC commissioners, and congressional leaders curbed AT&T's market power and lowered barriers to entry for competing firms, gradually transforming telecommunications from a one-firm industry into a fiercely competitive sector with multiple players. Two regulatory developments are particularly significant:

- After the breakup of the Bell System in 1984, ownership of telecommunications facilities (wiring and terminal equipment) inside buildings was taken away from phone companies and given to end users. End users could hire the local Bell company to perform

installation and maintenance work but were not required to do so. This created roles for independent “structured cabling” firms and installers of customer premise equipment such as call distribution systems and, eventually, data routers and servers.

- The Telecommunications Act of 1996 established guidelines for competition in local telephone markets and allowed long distance carriers, cable television companies, wireless service operators, and gas and electric utilities to offer local voice and data services over their systems. This dramatically increased the number of players seeking to provide commercial and residential end users with voice and data access. New entrants undercut established firms in part through lower labor costs, forcing the former Bell companies to become leaner.

Beyond these changes in regulation and market structure, the explosive growth of the Internet and of private data networks (local area networks and wide area networks) has transformed the communications industry technologically in the past decade.

Regulatory and technological changes have contributed to a volatile environment for workers. In the monopolistic Bell System, stable demand and regulated profits permitted extensive employee training, predictable career ladders, high pay, and relative employment security for technicians. In the aftermath of deregulation, however, AT&T and the regional Bells changed their labor practices with an eye toward competing with new, largely nonunion market entrants (Keefe and Batt 1997; Batt and Strausser 1997; Batt and Keefe 1999). Though telecommunications workers, on average, still earn more than the U.S. median, the gap is narrowing. Union coverage in the industry is down, real wages have fallen, and wage dispersion has risen (Table 8.1). Company-provided training and internal advancement is less common for technical workers in core firms. Additionally, cable television companies, which tend to have less generous employment policies than telephone communications firms, are growing much faster than their telecom counterparts (see Table 8.2).

Besides prompting changes within large enterprises, deregulation and technological change have created telecommunications-related technical work in firms that are not typically considered part of the communications services industry. Thousands of firms have emerged or

**Table 8.1 Changes for Technical Workers in the Telecommunications Services Industry
(Standard Industrial Classification 4810)^a 1983–96**

	1983	1996	% change 1983–96
Union density	67.5%	51.7%	-23.6
Median real weekly earnings	\$489	\$473	-3.3 ^b
Wage dispersion among union workers (90/10) ratio ^c	1.71	2.25	31.6
Wage dispersion among nonunion workers (90/10) ratio ^c	3.13	3.13	0.0

^a This SIC is roughly comparable to North American Industry Classification System code 5133.

^b This cumulative 3.3 percent decline conceals great diversity between high-paid union workers, low-paid union workers and nonunion workers with respect to wages. Union employees in the 90th percentile, largely because of bargaining trends and growing seniority, saw their wages increase 14.5 percent between 1983 and 1996. Union workers in the 10th percentile experienced a 13 percent decline, and nonunion employees' wages declined 7 percent.

^c Ratio of earnings of workers in the 90th percentile to earnings of workers in the 10th percentile. The highest-paid union technical workers earned 71 percent more than the lowest-paid union technical workers in 1983, for example.
SOURCE: Batt and Strausser 1997.

Table 8.2 Employees in Communications Infrastructure and Services Industries in the United States, mid-March, 1988 and 1997

Standard Industrial Classification	1988	1997	% change 1988-97
SIC 481—Telephone and radio communications	824,252	999,954	21.3
SIC 4841—Cable and other pay television broadcasting	104,614	174,351	66.7
SIC 1731—Electrical work (special trade contractors)	518,989	641,985	23.7
Total nonfarm private employment	110,873,900	131,381,200	18.5

SOURCE: Economic Census; Regional Economic Information System.

expanded in the past few decades to conduct inside wiring and equipment installation work that has arisen because of industry outsourcing trends and the broadband revolution. As technical work in the communications industry changes, both in skills and organization, it has more and more in common with the work done by IT technicians. Competencies and job profiles in some parts of the telecommunications sector are quite similar to those in IT, reflecting the increasing digitalization of telecommunications and the system's increasing connections to computers. While they are not conventionally considered communications industry employees, sought-after computer network administrators and technical support specialists have skills that increasingly overlap with those of communications technicians. Moreover, firm-specific training is being overshadowed in importance by external, industry-wide certifications. Examples include BICSI certification, which accredits people as structured cabling technicians; A+, which certifies a person's ability to diagnose and repair computer hardware; and Cisco, a manufacturer-sponsored series of accreditations that can be obtained by people with proficiency in data network configuration and administration. External certifications have become important mechanisms by which applicants, particularly the non-college educated, convey their qualifications to employers (Chapple and Zook 2000).

Another issue facing workforce development innovators is the communications industry's long-term patterns of sex segregation by occupation and of racial discrimination. Gender and race segmentation improved somewhat in the 1970s, particularly for women, as the AT&T Bell System became the target of federal efforts to enforce equal employment statutes (Noyelle 1987; Batt and Keefe 1999), but patterns of occupational dominance remain. In many smaller communications firms, hiring and promotion practices approximate those of the construction trades, which, although improving, have been notoriously closed to women and minorities (see Allen 1994). Thus, while female and minority applicants may now be more favorably received by hiring managers at core firms, access to smaller firms still requires a personal "bridge"—a contact with someone already employed at the firm. Helping low-income urbanites obtain entry-level jobs in this industry therefore demands that an organization be prepared to do more than train.

Technological convergence, the growing role of external certifications (particularly for applicants without college degrees), and the patterns of labor market discrimination described above have important implications for workforce development organizations. In urban areas rich with communications infrastructure, training that confers 1) baseline knowledge of the so-called physical layer of voice and data transmission systems, 2) familiarity with the workings of customer premise terminal devices such as personal computers (PCs), phone handsets and call distribution systems, and 3) working knowledge of the transmission devices (switches and routers) that allow telephones and computers to communicate with one another is valuable in and of itself in the labor market. It positions entrants for a number of different career paths (see Figure 8.1).³ Whether they can access those paths depends on their own initiative and also on the inventiveness of workforce development organizations and those who fund them.

INNOVATIVE LABOR MARKET INTERMEDIARIES

We turn now to three urban labor market intermediaries whose sponsors have identified this multifaceted career ladder problem in communications and IT and created workforce development initiatives that help low-income, non-college-educated job seekers to respond to its challenges (Table 8.3). These institutions are actually tackling two problems simultaneously. The first is the dilemma described above—the decline of within-firm training and career pathways. The second problem is the failure of the primary education system in many urban areas to adequately prepare individuals (particularly those from low-income households) for the labor market. Surveys of employers demonstrate that literacy, basic math proficiency and soft skills are crucial prerequisites even for relatively low-paying employment, but many job seekers have difficulty reaching this bar (see Holzer 1996; Harrison and Weiss 1998). Planners and program principals at intermediaries striving to serve low-income urban populations must at once be conscious of industry dynamics and of the multiple needs of their clientele—needs that may require aggressive case management and intervention.

Table 8.3 Case Study Organizations

	Sponsoring organization	First year of operation	Main funding source	Organizational partner/s	First step/s on career ladder ^a	Subsequent steps
East Los Angeles Skills Center telephone installation & repair program and information technology academy Los Angeles, CA	East Los Angeles Skills Center (part of Los Angeles Unified School District—LAUSD)	1985 (telephone program) 2001 (information technology academy)	Los Angeles Unified School District (LAUSD)	Los Angeles Community Technology and Education Center/on-site ESL, daycare, basic counseling, basic education	LAUSD Division of Adult and Continuing Education curricula—computer literacy and telephone installation/repair	C-Tech computer cabling certification; CompTIA A+; Microsoft Certified Systems Engineer (MCSE); Network Administration
Brooklyn Networks Brooklyn, NY	Brooklyn Workforce Innovations (a subsidiary of the Fifth Avenue Committee)	2001	New York State Department of Labor InVest Program	New York City Technical College; Communications Workers of America (CWA) District 1	BICSI Installer Level 1 curriculum	Individual development accounts for further training of participants' choice—BICSI Level II or Cisco Network Administration
Communications Workers of America H-1B Technical Training Project Fremont, CA San Jose, CA	Communications Workers of America National Education and Training Trust	2000	U.S. Department of Labor H-1B Visa Grant	Oakland Private Industry Council (now part of East Bay Works)	Basic introductory communications curriculum—BICSI installer concepts, DSL, introduction to PC technology	CompTIA A+; Cisco Network Administration

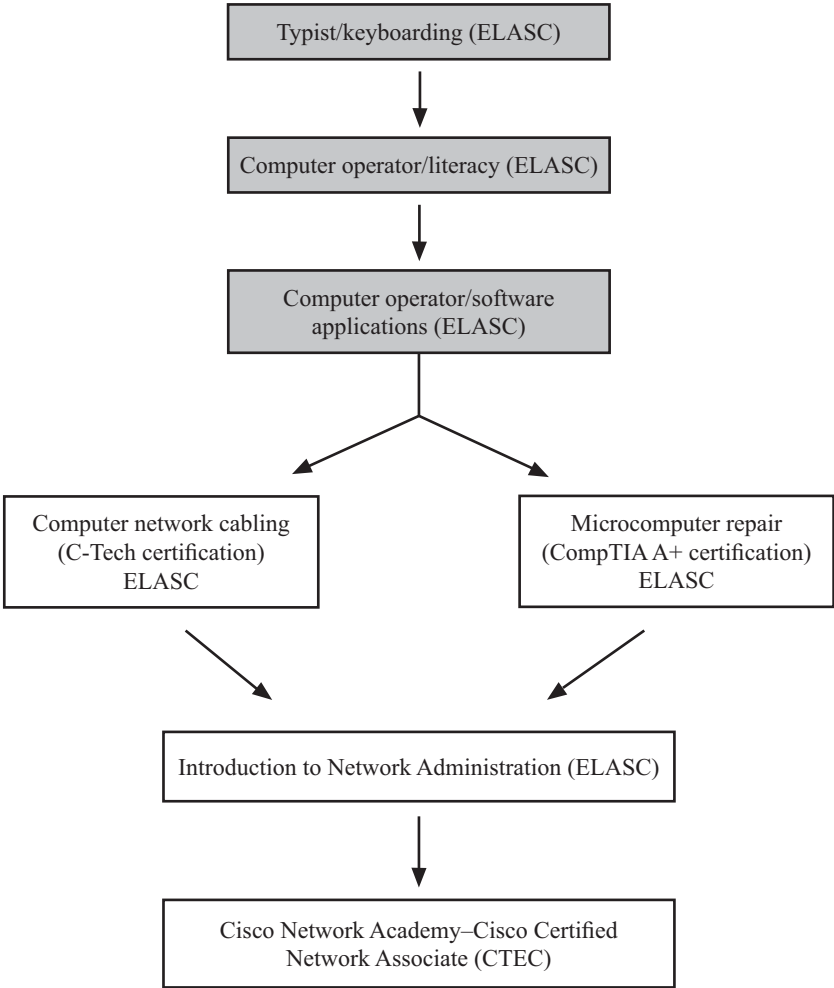
^a For detailed explanations of curricula and their acronyms, see Appendix 8A.

The East Los Angeles Skills Center Telephone Installation and Repair Program

The East Los Angeles Skills Center (ELASC), part of the Adult and Continuing Education Division of the Los Angeles Unified School District, is a community-based learning center that contains an alternative high school, adult basic education resources, and numerous vocational programs. In early 2001, ELASC added a fourth and a fifth stage to a standard three-stage progression of courses in microcomputer keyboarding and operations. The first addition is computer network cabling, which teaches students the cabling and software configuration skills necessary to link computers to the telecommunications system; the second is computer diagnostics and repair, which teaches students how to troubleshoot hardware problems within the computers. The network cabling and computer repair courses build the knowledge needed to study computer internetworking using both Cisco and Microsoft software. Two networking courses represent the final steps on the career ladder (Figure 8.2). For these courses, ELASC students attend the Community Technology and Education Center (CTEC), a new facility at the Los Angeles River Center building which receives funding both from the City of Los Angeles and through the Workforce Investment Act.

The IT career ladder developed by ELASC and CTEC articulates with the basic keyboarding and software applications courses that people seeking clerical jobs often elect to take. Thus, some students get off the ladder and use their keyboarding and word processing skills to get jobs, but those who develop an interest in how computers work have a chance to switch to a technical field. The ladder also articulates with one of ELASC's strongest blue-collar-oriented programs, Raul Macias' course in telephone and local area network installation and repair.⁴ Macias, a former Pacific Telephone and General Telephone and Electric (GTE) employee and himself a graduate of ELASC, helps about 200 students per year complete a curriculum that includes instruction in voice and data cabling installation, cable splicing, and troubleshooting (on fiber optic and copper cable) and the basics of programming electronic telephones and private branch exchange switches. Most students in his course go directly into jobs with southern California telecommunications firms (either major local exchange carriers like GTE or "interconnect" firms), often building on Macias' personal contacts in these

Figure 8.2 ELASC/CTEC Information Technology Career Ladder



firms or on relationships that ELASC's principal, Peter Fernandez, has built through an industry advisory board. But many of them turn to the ELASC/CTEC training academy, either before seeking a job or once employed, for the skill upgrades that make them more marketable in either standard telecommunications or more advanced network technology occupations (Table 8.4). A student who has successfully completed Macias' communications course would be able to skip network cabling and enroll directly in microcomputer repair or network administration (see Figure 8.2). These courses are offered at a subsidized cost of \$70 each, well below the price charged by private training vendors.

ELASC emphasizes short-term, competency-based training on the "open entry, open exit" model, which has proven successful for other programs that work with a disadvantaged clientele, such as San José's Center for Employment Training (Meléndez 1996; Harrison and Weiss 1998). Courses do not have fixed starting and ending dates. Students can start a course at any point and proceed at their own pace. The atmosphere approximates that of a workplace rather than that of a school, not only because most of the instruction is hands-on but because people enter and move on at different times depending on their readiness. In the classroom, advanced trainees solidify their knowledge and practice their skills by demonstrating tasks for new entrants to the program or by informally supervising their work.

In another parallel to the Center for Employment Training, ELASC is closely connected to a variety of indigenous organizations and political leaders.⁵ These relationships prove critical in two ways. First, support from community leaders and elected officials has enabled the center, working on its own, to raise funding from state and federal government that augments its budget. Resources from the school district alone would only be enough to fund classroom teachers, but with the extra funding ELASC is able, among other things, to employ an 11-member counseling staff and to offer financial assistance to telecommunications graduates to help them purchase tools and work boots, which many employers require them to own. Second, the center shares its site on Selig Place in East Los Angeles with a mental health care provider, a community-based English as a Second Language (ESL) provider, and a daycare center, all of which help students overcome barriers to completing their training. It also maintains close relationships with neighborhood groups that are not located at its site. According to Harrison

Table 8.4 Success Rate of Information Technology Academy—East Los Angeles Skills Center and Community Technology Education Center, September 2001–February 2002

Students completed/ enrolled in computer network cabling course	Students completed/ enrolled in microcomputer repair (A+ certification)	Students completed/enrolled in introductory network administration	Students completed/ enrolled in network administration (CCNA)	Graduates placed in pertinent employment	Average wage at placement
30/40 (75%) ^a	5/20 (25%)	25/100 (25%)	20/50 (40%)	50/80 (62.5%)	\$15.00/hr

^a Program administrators provided estimates to the nearest 5%.
SOURCE: East Los Angeles Skills Center.

and Weiss, residents of low-income areas seeking skills and jobs often turn to community-based organizations (CBOs), which act as agents to “break paths, open doors, insist on quality services, and negotiate collectively with employers and governments” (1998, p. 39). ELASC clearly serves this function for many of its clients.

In part because of ELASC’s commitment to short-term vocational training that immediately puts people into the labor force, advanced training in information technology did not initially seem to fit within its mission. But as ELASC and CTEC leaders began working together, the idea of an external career ladder that students could climb onto and off of eventually took shape. According to an ELASC project coordinator who helped develop the relationship with CTEC, “My fear was that somebody would have to be here four years to go to work. The commitment we make to vocational students here is that after six months you’ll get a job. So we had to make sure that at every point, after every class we [sponsored], people would be able to go to work if they wanted.” According to their needs and resources, some students choose to go straight through the entire progression of courses in the career ladder and then seek employment, while some take one or two modules, go to work, and return in the evening to upgrade their skills. Others choose to step off the ladder at a certain point and hold steady in a particular job or rely on informal on-the-job training to advance.

The Adult Division of the Los Angeles Unified School District has supported ELASC with no-strings-attached funding to hire instructors and provide training of whatever duration participants require to become competent. But the school district has also given administrators the leeway to develop external partnerships, raise funding independently, and co-locate with other local organizations. The East Los Angeles Skills Center has used this flexibility to great advantage and manages to combine a CBO-like atmosphere with the resources and wherewithal to design curricula and impart technical skills. Staff at ELASC have drawn on this strong base as they have worked with CTEC.

Brooklyn Networks

Whereas the East Los Angeles Skills Center worked with a community technology center to build additional rungs onto a communications career ladder whose basic skills components already existed in the insti-

tution, Brooklyn Networks (BN) sought to develop a training program that would get people onto a viable “first step.” In order to do this, staff employed a sectoral strategy, an approach that has gained currency in both economic and workforce development in the past several years (Clark and Dawson 1995; Bosworth 1998; Fitzgerald 2000). One staff member describes how the organization settled on a sector: “We were looking around for career ladder jobs in what was then being called the “new economy.” We had three criteria: 1) we wanted a growing sector where demand was high all along the career ladder; 2) we wanted the entry-level, first-rung jobs to pay wages that were enough to support a family, so that people could make a living wage right away; 3) we wanted the jobs to be accessible, so that people could get started in the career with relatively short-term training. We hit upon communications cabling and discovered that it met our criteria.”

As part of their sectoral approach, staff members at Brooklyn Workforce Innovations (BWI), the community group that initiated the program, did extensive research on New York City’s communications sector, surveying employers about their labor force needs and employment practices.⁶ They learned that while some of the larger firms (including Verizon, the region’s local exchange carrier) trained their own employees and had well-defined promotion systems, many of the newer employers in the industry had very little human resource infrastructure. However, these very employers had great need for entry-level workers at the time and expressed interest in hiring graduates of a cabling training program. Having gotten a basic picture of the industry (and, not incidentally, having built initial bridges to employers), BWI’s staff created a program that prepares people to become entry-level communications cabling installers and then positions those who land at firms without internal career ladders to get additional training in communications equipment and network installation.

One product of BWI’s research was the decision to use the Building Industry Consulting Services International (BICSI) Installer Level I curriculum. In addition to being known and respected by employers, the curriculum has a built-in career ladder, consisting of three separate certifications meant to be earned over a five-year period. Thus, BICSI Level I graduates can continue with the curriculum over time, either with employers’ assistance or through Brooklyn Networks’ Individual Development Account option (discussed below). Becoming licensed to

teach the BICSI curriculum is expensive—an organization must outfit a laboratory with high priced equipment, send its instructors for training and certification and buy costly materials. (Through a partnership arrangement with New York City Technical College, BWI conducts classes in a room at the college which it has outfitted with state-of-the-art equipment as specified by BICSI.) BWI decision makers judge this outlay to be worthwhile, however, because BICSI's defined career path jibes with the likely career experience of the program participants.

A supportive learning environment, with dedicated teachers and a team atmosphere, is perhaps the key to the success that Brooklyn Networks participants have had in passing the difficult BICSI certification exam.⁷ The instructors have many years of industry experience, having worked at New York Telephone and its successor, Verizon, in technical and managerial positions. It is important to the program's success, however, that the instructors also see themselves as educators (one, Rose Fahey, holds a masters degree in education). They worked at the beginning of the program to break the BICSI curriculum into what staffer Josh Wallack calls "manageable chunks" so that the students would be able to understand its concepts more easily.⁸ Instruction includes two days of team-building activity in which students get to know program staff (two instructors, a vocational counselor and a job developer) and work with one another to develop the sense of teamwork they will need to get through the course material and pass the BICSI certification exam. Students are paired through a buddy system during the training, encouraged to practice in groups in the hands-on lab on their own time, and offered a "job club" option during the placement phase so that they can support one another in their bids to find jobs. The extensive experience that BWI and its parent organization, the Fifth Avenue Committee, have in providing social support and advocacy to low-income clients has served the organization well here, since a variety of resources are readily at hand to help participants meet the challenges inherent in this rigorous curriculum.

Another element of BWI's career ladder strategy is a relationship between Brooklyn Networks and local leaders of the Communications Workers of America (CWA), which represents most employees at Verizon and many employees of the area's smaller cabling firms. In contrast to the way it is in other cities, much of the telecommunications cabling work done by small firms within New York City's five

boroughs is handled by unionized firms, and a working relationship with a union was thus a critical precondition for success. Additionally, BWI staff recognized that CWA leaders were well acquainted with the concept of skill and wage mobility, having incorporated career ladders into collective bargaining agreements with Verizon and its predecessors for decades. CWA officials have helped BWI develop contacts at small cabling infrastructure firms. CWA leaders have also visited the Brooklyn Networks classroom to talk about the communications industry and have offered to help prepare BN graduates for the Verizon entry-level installer exam.⁹ Additional opportunities for cooperation may arise if CWA locals in the New York area become more involved in designing and administering training for telecommunications employees.¹⁰ These efforts on CWA's part tie in with the union's commitment to become more inclusive of minorities and to be more active as a force for economic development in the city's low-income communities; BWI has provided an opportunity for the union to work in a concrete way toward these objectives.

In light of the economic downturn affecting New York City for the past several quarters, Brooklyn Networks has achieved a relatively high placement rate for graduates, even those who did not pass the BICSI certification exam (Table 8.5). Making resources available to graduates who want to advance further along the career path has now become a matter of concern. To that end, BWI has received a grant from the Robin Hood Foundation to help Brooklyn Networks graduates set up Individual Development Accounts (IDAs). IDAs are matched savings accounts similar to Individual Retirement Accounts (IRAs); graduates contribute monthly, BWI matches their contributions, and the money that accumulates finances additional training. Program staff encourage BN graduates to use IDA proceeds either for BICSI Level 2 training or for Cisco Network Administration training and couple career counseling efforts with financial literacy seminars.

While its CWA partnership is central to BN's success, notably absent is a strong relationship with the city's Workforce Investment Board (WIB). Advocacy groups in New York City have expressed concerns about the city's workforce development system since the inception of the WIB in 2000, voicing anxiety that the organization is mired in controversy among city and state agencies and that badly needed efforts to link workforce development to economic development are not going

Table 8.5 Success Rate of Brooklyn Networks (Brooklyn Workforce Innovations), July 2001–December 2003

Total students enrolled	Students completing 5-week course	Students placed in pertinent employment	Average wage at placement	% who receive benefits with job
89	78 (87.6%)	57 (73.1%) ^a	\$10.25/hr.	71 ^b

^a Indicates percentage of those completing course who were placed in telecommunications jobs.

^b Includes 2003 participants only.

SOURCE: Brooklyn Networks.

forward. Under Mayor Rudolph Giuliani, the city's Human Resources Administration spent only a fraction of the federal funds available for workforce development in the city (National Employment Law Project 2000; Fischer 2001). Thus, BWI has had to pursue its sector-based workforce development strategy on its own, without broader city support or technical assistance.

CWA National Education and Training Trust (CWA/NETT) H-1B Technical Training Project

In addition to collaborating with community-based organizations such as Brooklyn Networks, the Communications Workers of America acts as a labor market intermediary in its own right. Local union chapters in northern California and Cleveland offer apprenticeship training to employees of CWA-represented firms that do not have the economies of scale needed to mount internal training efforts (the employers pay into a joint apprenticeship training trust fund similar to those that exist in the building trades). Collaborations with telecommunications equipment enterprises such as Cisco Systems make it possible for CWA members nationwide to take online courses leading to advanced technical certifications (such as the Cisco Certified Network Associate curriculum, or CCNA) at reduced cost.

CWA's contracts with large communications companies have traditionally defined career and wage progression for employees of those firms but left the measures up to the companies to implement; the idea of union involvement in training is new. CWA officials first articulated it in the late 1980s as they monitored trends in the industry and saw the explosion of small telecommunications wiring contractors who were being hired (in place of large phone companies) to install voice and data infrastructure in commercial buildings. According to Cleveland-area leader Ed Phillips, an early proponent of broad-based training, "If you have basic training in voice and data cabling, you can then go on to become proficient in any number of other skills, like data network configuration, systems integration, etc. It's like fingers leading off a hand. You can stick with cabling and go in that direction, or you can get more involved on the computer side or the router side. Once they have the basics, people can learn in a number of directions."

The H-1B Technical Training Project, so named because it is funded by the fees paid to the federal government by applicants for H-1B alien work visas, provided career ladder training not for union members, but rather for unemployed and underemployed northern California residents who have sought assistance from a public sector workforce development agency. In getting involved in a more community-oriented workforce development effort in northern California and elsewhere, CWA signaled its interest in becoming more engaged in the communities around its local offices. This mirrors efforts in the labor movement as a whole to leverage education and training to help redefine organized labor as a “social movement” with deep roots in communities (see Parker and Rogers 2000; Swinney 2001; Takahashi and Meléndez 2002).¹¹

The project, funded by the U.S. Department of Labor through its H-1B Skills Training Grant Program, was a partnership with the Oakland Private Industry Council, which runs a WIA-designated One-Stop Career Center in downtown Oakland under the terms of the Workforce Investment Act.¹² In 2000 and 2001, the Private Industry Council (PIC) recruited and oriented 126 participants in Oakland, and students traveled to the CWA/NETT site (originally located 30 miles south in Fremont, but eventually housed at CWA Local 9423 in San José). There they took a two-week, 60-hour training course that covered the basics of structured voice and data cabling, direct subscriber line (DSL) technology, and personal computer technology. They then had the option of continuing: CWA and PIC staff encouraged students who had completed the foundation training to return to CWA’s facility for upgrade training as computer technicians (known as A+) or as internetworking technicians (using the CCNA curriculum). Although the program no longer is in operation, it showed promise: by December 2001, 38 percent of the graduates of the two-week course had registered for upgrading (Table 8.6). Some of the participants treated A+ and CCNA training as direct continuations of their initial training and continued to be full-time “learners,” while others got jobs and returned to CWA in their spare time to gain the skills necessary for advancement.

The career ladder component of the northern California H-1B program was accessed primarily through distance learning. Though most program graduates were physically present in CWA’s Cisco training lab for A+ and CCNA instruction, the courses themselves were taught online through an arrangement between the CWA and Stanly Community

Table 8.6 Success Rate of CWA/NETT and Oakland Private Industry Council H-1B Technical Skills Training Program, July 2000–November 2001

Students enrolled	Students completing 2-week course	Total students employed as of March 2002	Students in pertinent employment ^a	Average wage at placement ^b	Completing students who have enrolled in A+ or CCNA
126	105 (83%)	68 (65%)	21 (20%)	\$12.76/hr.	40 (38%)

^a Indicates percentage of those who completed course who were placed in telecommunications jobs as of March 2002.

^b Wages are for the 18 students in pertinent employment whose starting wages could be verified.

SOURCE: CWA/NETT.

College in Albemarle, North Carolina.¹³ Staff members of CWA/NETT served as proctors, helping students in the lab as necessary, but there were no formal class sessions. This aspect enabled students to come to the training lab when it was convenient for them and to learn at their own pace, echoing ELASC's open entry/open exit approach. It reduced students' sense of being part of an organized effort, however, since although they had online mentors from the community college and proctors in the lab, they did not have classmates in the traditional sense and their primary interaction was with a computer program. This flexibility and independence was better suited to some learners than to others, according to program director Jim Landers.

A challenge that faced the CWA/NETT H-1B program was its distance—in many senses—from its workforce development partners in Oakland. The Fremont site where the training classes were first held was a 40-minute drive from Oakland (where most participants live), and the facility later moved farther south to San Jose. Although the PIC worked with local community groups to arrange transportation from Oakland to the CWA training site, the physical distance from the city posed problems for participants, particularly in the skill-upgrading phase. The division of labor between the union education center and the Private Industry Council, an arrangement in which participants trained at a CWA site but remain tied to the PIC for social support and job placement, created distance of a less tangible sort. CWA/NETT concluded that a union entity was less well suited than the PIC to handle case management and job placement. Yet the union's less involved stance, particularly with regard to placement, arguably reduced students' informal contact with union members and employers and thus canceled out some of the advantages that a union might have been expected to have in the workforce development arena.

CWA/NETT's experiment with providing training to the largely economically disadvantaged population served by WIA one-stop centers in the East Bay concluded at the end of 2002 after eight two-week telecommunications overview courses. The computer laboratory continued to be available through 2002 to graduates of these classes, as well as to others referred by the one-stop. CWA/NETT staff conducted classroom instruction leading to A+ and CCNA certification—four A+ courses and three CCNA trainings through December of that year. After

that, however, CWA staff began to direct their efforts entirely toward skill upgrading for people who were already members of the union.

The reasons behind this shift—or, rather, this step back from an arena the union had been tentatively exploring—are various. First, the economic picture had clouded since CWA/NETT was founded, and there are fewer technical jobs in the information infrastructure industry available at entry level to people with short-term training, or even with A+ and Cisco certification. Second, and perhaps more importantly, CWA as an institution is pulled in several directions by the changing economy. On one hand, union leaders are motivated by a desire to represent a greater proportion of the increasingly diverse (and increasingly contingent) communications and information workforce. Technological transformations such as the move toward broadband connectivity, combined with the trend away from company-provided training, make skill development a strategic area for the union.¹⁴ In this view, the union's implementation of public sector grants to train underemployed and unemployed workers is an opportunity to help build a pool of skilled workers and to stimulate enthusiasm for the union. It is also a way for the union to fulfill an expansive social mission rather than taking the bread and butter approach which many believe has contributed to union decline in recent decades (Takahashi and Meléndez 2002).

At the same time, CWA remains a membership organization. In the communications sector, local leaders and their national counterparts represent the interests of existing members, most of whom work for the still heavily regulated former Bell companies. Locals representing these members are often focused on preserving employment security, high wages, and traditional job ladders within firms whose employment practices, although in flux, remain based on internal labor markets. In this view, the union's efforts to train underemployed and unemployed workers are superfluous, since training has traditionally been, and should continue to be, the province of employers. Tension between these two points of view has affected the CWA in recent years and was likely a contributing factor in the union's decision not to seek federal funding to continue the H-1B project in its initial form after 2002. The union has, however, rededicated itself to promoting skill upgrading among existing members, both to help them achieve mobility within their companies and to make job transition easier in the event they are laid off.

TOWARD A SET OF GENERAL PRINCIPLES FOR CAREER LADDER STRATEGIES IN THE INFORMATION INFRASTRUCTURE INDUSTRY

The three programs profiled in this report are dedicated to helping their clients achieve basic proficiency in telecommunications infrastructure installation. They are also striving to provide resources that those clients who are not placed in workplaces with internal career ladders can use to move beyond their first jobs. Culled from a larger sample of eleven intermediaries in the field, they represent the diversity—in terms of both sponsoring organizations and program components—of programs that exist to support people on this particular career path.

While one must always qualify an attempt to generalize from a small sample, the case studies that underlie these profiles yield some principles that policymakers and funders can apply to future initiatives. Examined together, the three cases impart important lessons about how to organize and replicate viable career ladder-oriented training for low-income job seekers. The lessons are most applicable in the communications and IT sectors, but they have implications for other sectors in which career and wage progression exist and in which living-wage jobs are both identifiable at entry level and attainable by non-college-educated applicants. The following principles can be gleaned.

1) Research that identifies articulation points between telecommunications and IT skill sets, and that develops a picture of how access to the industry is structured in a particular labor market, enables organizations to develop interventions that help their clients progress along external career ladders.

The convergence of voice, data, audio, and video technologies in offices and homes, together with profound structural change in the regulated telecommunications industry, calls for a revised understanding of occupations, certification practices and career ladders in both telecommunications and IT. The organizations profiled in this chapter have taken up that challenge, recognizing that the skill sets of telecommunications technicians exist on a continuum with those of computer network administrators and that external certifications (rather than within-firm training) are often the key to advancement. Beyond this recognition lies a pedagogical issue: that it is crucial not only to identify these articula-

tion points between skill sets but also to shape the curriculum materials associated with external certifications, targeting them to learners with a high school education or less.

It is also important that intermediaries understand the structure of access to information infrastructure jobs in their local labor markets. Brooklyn Networks' assessment of the sources of labor market demand for telecommunications technicians in the New York area informed its choices of curriculum and organizational partners, which have been key elements in its success. The other two organizations (ELASC/CTEC and CWA/Oakland One-Stop) have not conducted as thorough and explicit an analysis of local labor markets: here the research is more informal, based in Los Angeles on an industry advisory board and in the East Bay area on unions' familiarity with local employers.

2) Successful IT career ladder systems for low-income individuals have three components: links to organizations and social institutions in their communities, technical expertise in training for the sector, and strong relationships with employers.

Workforce development research consistently shows that social supports, high quality training, and access to employers are the three keys to helping low-income job seekers move from unemployment or underemployment into living-wage labor markets. The case studies here demonstrate that this is, unsurprisingly, equally true for programs that have career mobility as an objective. They also demonstrate, however, that in creating a program with these components, a variety of combinations of internal resources and external partnerships are viable. Some of the necessary strengths come from within the sponsoring organizations, while others are achieved through collaboration with organizational partners and cosponsors. To echo the findings of another recent study of technology training programs, "Regional partnerships and coordination maximize the impact of training efforts, allowing programs to focus on their strengths" (Chapple et al. 2000b, p. 20).

3) The participation of community-based service and advocacy organizations in information infrastructure training consortia contributes to programs' success.

Training low-income individuals for occupations where technical expertise and certification are involved requires the participation of in-

stitutions (whether firms, colleges, or labor unions) that are not strictly neighborhood-based. But this study also confirms the logical precept that such training is rarely effective without the participation of community-based organizations (Harrison and Weiss 1998; Glasmeier, Nelson, and Thompson 2000; Fleischer 2001). The level of trust that community-based service and advocacy groups can achieve among participants enables them to do effective case management, helping trainees to cope with family issues, transportation, and child care and helping to guide them toward educational support when needed. The involvement of CBOs' leaders as mentors and advocates also helps participants to challenge traditional patterns of gender and racial segmentation in technology-intensive industries. ELASC instructor Raul Macias welcomes women into the telephone repair course, for example, and his encouragement builds their confidence in their technical abilities. Brooklyn Networks staff members, in their pursuit of strategic partnerships, assume a role that might be described as a combination of job development and client advocacy. They have successfully engaged New York area CWA locals (whose leadership is primarily white and male) in promoting Brooklyn Networks graduates (who are primarily black and Hispanic) to CWA-represented contractors as potential hires.

4) Institutional and financial support from the public sector, especially at the local level, could improve and expand career ladder initiatives for information infrastructure occupations.

In the cases profiled here, organizations have tailored training to career pathways they have identified. In doing so, they have developed partnerships and funding streams. But their efforts are not systematically tied, financially or organizationally, into broader regional sectoral strategies for workforce development. The exception here is ELASC/CTEC, where Los Angeles officials have dedicated Workforce Investment Act dollars to the latter part of the IT skills continuum. In general, however, decision makers at local Workforce Investment Boards could do more to strengthen career ladder programs in the information infrastructure industry. In particular, they could support efforts to provide upgrade training to technology workers at small firms that lack formal training programs. This would be a promising investment because incumbent workers, with relatively short training courses, could advance to fill higher-level openings and make room at entry level for other trainees.

5) Labor unions help to structure entry-level access to the telecommunications and IT sectors, but their role is an ambivalent one.

Effective labor intermediaries, according to Fitzgerald, have the capacity not only to connect supply with demand, but also to influence demand (2000, p. 29). Although community colleges, Community Development Corporations (CDCs), and other training providers have successfully persuaded employers to train more intensively and to take high-skill, high-wage paths to profitability, unions, by virtue of collective bargaining agreements, are in a unique position to wield such influence. The industry's history of unionization is a partial explanation for why most telecommunications technicians earn high wages, even in nonunion firms. Thus, one might expect best practice approaches to career ladder-oriented training in this field to routinely involve unions.

As the profile of the CWA's H-1B program demonstrates, however, the reality is more complicated. Unions in telecommunications are pulled in many directions by the changing structure of their industry. They are motivated both to expand the scope of their membership and activities in concert with a rapidly changing industry and to fulfill the expectations of members still operating under the rules of the old industry. Unions are also inexperienced at being workforce development organizations and at dealing with the requirements of public funding sources. As a result, models such as Brooklyn Networks, which rely on close relationships with unions but do not involve them as primary program sponsors, may ultimately be the most effective way of drawing on unions' strengths.

CONCLUSION

The information infrastructure industry is one of a small number of sectors in which living-wage entry-level jobs are accessible with brief training, and in which a career ladder is evident. In this sector, industry analysis suggests, some individuals will be fortunate enough to obtain first jobs with employers that have internal career tracks (such as the former Bell local exchange carriers). Some will learn enough on the job that they will be able to advance across firm boundaries on their own. Some will, because of time constraints, educational limitations, or preference, remain in an entry-level job by choice (see Fitzgerald 2000;

Fitzgerald and Carlson 2000). But many will be involuntarily stuck on the first rung of the job ladder.

The organizations described here are working to position low-income clients to take fuller advantage of career ladders that exist in the information infrastructure industry. This entails putting people on track—i.e., introducing them to a sector in which they may not have considered becoming employed—then, helping them to get entry-level positions, and, finally, creating infrastructure within which they can access skill upgrading and career counseling and move to higher-skilled, more remunerative jobs. Their training job has been made more straightforward by the existence of external certifications such as BICSI and Cisco, and all three programs identified the need for certain basic components: links to organizations and social institutions in their communities, technical expertise in training for the sector, and close relationships with employers.

Organizations whose leaders are thinking beyond the standard workforce development outcomes of job placement and retention are unusual. A push from federal and state funding sources could catalyze change in this area, as could more concerted interest from local Workforce Investment Boards. The U.S. Department of Labor has shown a promising interest in training for incumbent workers in recent years (Fitzgerald 2000). The high-growth information infrastructure sector would be an excellent candidate for investment in incumbent worker training, because if such training succeeded, it would create more entry-level, relatively high-wage opportunities in urban areas for workers with short-term training.

Notes

1. While large firms often provide training, pensions, and health insurance and pay efficiency wages, outside contractors to which functions are outsourced tend to forego these practices and tolerate low quality and high turnover.
2. For discussions of all three trends, see Cappelli et al. 1997; Herzberg, Alic, and Wial 1998; Osterman 1999.
3. The career paths conception outlined in Figure 8.1 is a result of the author's interviews with training providers, employers, and academic specialists in workforce development in the three focus regions—northern and southern California and New York City.

4. Since word processing and other clerical work on computers have traditionally been female-dominated, most of the participants who enter the career path from this direction are women, whereas most of the people who enter from the telephone class are men. In the computer support and networking courses, then, there is a more equal gender mix.
5. While officially part of the school district, ELASC's original parent was a War on Poverty-funded community learning center started in the mid-1960s, and the institution has clearly been intent on keeping what one leader referred to as its "personal touch, its ability to work with people individually."
6. Brooklyn Networks is a project of Brooklyn Workforce Innovations, which is the workforce development subsidiary of the Fifth Avenue Committee, a community development and advocacy organization serving South Brooklyn.
7. Instruction for an initial class of 18 students began in July 2001, and in May 2004 the program completed its fourteenth five-week cycle. Participants attend class six hours a day, five days a week, with part of each day devoted to employability skills and workplace professionalism.
8. The BICSI curriculum is designed for learners with higher educational levels than most of the low-income job seekers participating in Brooklyn Networks, despite the fact that participants are required to be at only an eighth grade reading level.
9. However, Verizon has not hired new employees at entry level since 2001.
10. CWA and Verizon considered forming a hiring hall-type structure through which Verizon installation and repair workers would be employed on an as-needed basis but were unable to come to agreement on how it would be structured.
11. The Takahashi and Meléndez paper appears as a chapter in this volume.
12. Under the same Department of Labor grant, CWA/NETT works in the Washington, DC, area with students referred through the Workforce Investment Board of Prince George's County, Maryland.
13. If they wish, individuals can take the community college-sponsored courses using their home computers, but most of the participants in this program do not have Internet connections in their homes.
14. One local leader in northern California commented, "We feel we have to become a training ground for the worker. In this age the Bells are moving away from the old 'we train you, we know it all' model. Especially in an economic downturn, training costs are scrutinized. Training is an area that is pushed away."

Appendix 8A

Telecommunications and Networking Technician Certification Models

BICSI INSTALLER CERTIFICATION

Building Industry Consulting Services International (BICSI), is a professional association for telecommunications infrastructure design and installation firms. It has been in existence since 1974, mainly as a trade association for cable plant designers and engineers. In 1997 it began a program to train and certify cable installers and technicians. Installer training is offered at BICSI conferences and seminars held in different parts of the country and is also licensed to proprietary schools and to local groups (such as Brooklyn Networks). BICSI's training teaches basic knowledge of premise cabling standards and cabling media, as well as techniques for "pulling" cable, splicing it, terminating it, testing networks, and troubleshooting problems. Its more advanced levels introduce LAN hardware and software. Certification is awarded to people who pass BICSI exams regardless of whether they have been through the training. The unsubsidized cost of each level of BICSI training is \$950, plus exam fees.

C-TECH ASSOCIATES NETWORK CABLING SPECIALIST CERTIFICATION

C-Tech Associates Incorporated is a New Jersey-based training company that has developed short-term job training curricula to prepare people for entry-level network cabling jobs. C-Tech courses are taught using equipment that is stored in small cases, which means that the sponsoring institution does not have to build out an expensive lab and can use space flexibly. C-Tech designs, develops, and manufactures the classroom equipment. Since its founding in 1995, C-Tech has expanded to more than 260 certified training facilities (CTFs) throughout the United States. C-Tech training materials are used by community colleges, high schools, U.S. Job Corps centers, correctional facilities, and trade unions. The East Los Angeles Skills Center is one such facility.

A+ COMPUTER TECHNICIAN CERTIFICATION

The A+ certification is sponsored by the Computing Technology Industry Association (CompTIA), a trade association made up of computing and communications companies. A+ certified students can demonstrate competency in troubleshooting hardware for IBM compatibles and/or Macintosh computers using MS-DOS, MS Windows, or Mac OS software. A+ is a vendor-neutral standard, which means that holders of the certification can be assumed to know how to troubleshoot and repair hardware problems with all PCs. A+ is chiefly an exam, not a curriculum, though it is possible to buy from CompTIA a job task analysis which outlines the competencies covered on the exam (some training organizations have used this as the basis for developing a curriculum). According to CompTIA, the A+ exam is “targeted for entry-level computer service technicians with at least six months’ on-the-job experience,” but it may also be useful for helping telecom technician trainees gain basic proficiency with computing hardware. A San Francisco-based effort to train disadvantaged adults as network administrators has used A+ certification as a beginning step in that process—helping the trainees gain basic familiarity with PCs through A+, then moving them into Cisco Certified Network Associate training (described below).

MANUFACTURER CERTIFICATIONS

This type of certification is issued by manufacturers of cabling and network equipment as a marketing tool and distribution strategy. A manufacturer offers an installation contractor free or inexpensive training for the contractor’s employees in the installation and maintenance of a particular kind of cabling or network switch; when the designers and installers employed by the contractor complete the vendor-specific course, the contractor becomes authorized to install and maintain that manufacturer’s equipment. Installation contractors use manufacturer certifications to promote their services to potential customers. They may also act as value added resellers, marketing and reselling the equipment of the manufacturers with which they are affiliated.

THE CISCO CERTIFIED NETWORK ASSOCIATE (CCNA) CERTIFICATION

The CCNA is a manufacturer certification focused on LANs and WANs powered by Cisco switches and routers. Unlike other manufacturers, Cisco has made its exams—along with an extensive training program—available through training partner locations (where instructor-led training is offered) and through remote learning labs, where students learn by means of a Web-based curriculum. Trade schools, community colleges, unions and even CBOs have become training partners and lab locations; they essentially resell Cisco training to students (in the case of nonprofits, they provide it at cost or at a subsidized price). Cisco training is said to be about 20 percent specific to Cisco products and 80 percent generic, so many people take the Cisco route to becoming familiar with the installation, configuration, and operation of LANs, WANs, and dial-up access services. CCNA training has been suggested as a follow-on to A+ training and to basic cabling training.¹ The CWA has negotiated a special arrangement with Cisco and has set up several Cisco remote labs with the goal of providing union members with skills upgrading opportunities.

Appendix Note

1. Cisco also offers two additional levels of training: CCNP (network professional) and CCIE (internetworking expert).

References

- Allen, Steven G. 1994. "Developments in Collective Bargaining in Construction in the 1980s and 1990s." In *Contemporary Collective Bargaining in the Private Sector*, Paula B. Voos, ed. Madison, WI: Industrial Relations Research Association, pp. 411–445.
- Batt, Rosemary, and Jeffrey Keefe. 1999. "Human Resource and Employment Practices in Telecommunications Services, 1980-1998." In *Employment Practices and Business Strategy*, Peter Cappelli, ed. New York: Oxford University Press, pp. 107–152.
- Batt, Rosemary, and Michael Strausser. 1997. "Labor Market Outcomes of Deregulation in Telecommunications Services." Paper presented at the 50th annual meeting of the Industrial Relations Research Association, held in Chicago, January 3–5, 1998.
- Bosworth, Brian. 1998. "Regional Economic Analysis to Support Job Development Strategies." In *Jobs and Economic Development: Strategies and Practice*, Robert Gilroth, ed. Thousand Oaks, CA: Sage Publications, pp. 85–104.
- Cappelli, Peter, Laurie Bassi, Harry Katz, David Knoke, Paul Osterman, and Michael Useem. 1997. *Change At Work*. New York: Oxford University Press.
- Chapple, Karen, and Matthew Zook. 2000. "Why IT Jobs Stay." Paper presented at the annual conference of the Association of Collegiate Schools of Planning, November 2–5, Atlanta.
- Chapple, Karen, Matthew Zook, Radhika Kunamneni, AnnaLee Saxenian, Steven Weber, and Beverly Crawford. 2000a. *From Promising Practices to Promising Futures: Job Training in Information Technology for Disadvantaged Adults*. New York: Ford Foundation.
- . 2000b. *From Promising Practices to Promising Futures: Job Training in Information Technology for Disadvantaged Adults: Synthesis of Key Findings*. Oakland, CA: PolicyLink.
- Clark, Peggy, and Steven Dawson. 1995. *Jobs and the Urban Poor: Privately Initiated Sectoral Strategies*. Washington DC: Aspen Institute.
- Fischer, David. 2001. *Under the Mattress: Why NYC's Jobs System Remains a Work in Progress*. New York: Center for an Urban Future.
- Fitzgerald, Joan. 2000. *Community Colleges as Labor Market Intermediaries: Building Career Ladders for Low-Wage Workers*. New York: Ford Foundation.
- Fitzgerald, Joan, and Virginia Carlson. 2000. "Ladders to a Better Life." *The American Prospect* 11(15): 54–60.

- Fleischer, Wendy. 2001. *Extending Ladders: Findings from the Annie E. Casey Foundation's Jobs Initiative*. Baltimore: Annie E. Casey Foundation.
- Glasmeier, Amy, Candace Nelson, and Jeffrey W. Thompson. 2000. *Jane Adams Resource Corporation: A Case Study of A Sectoral Employment Development Approach*. Washington DC: Aspen Institute.
- Graham, Steven, and Simon Marvin. 1996. *Telecommunications and the City: Electronic Spaces, Urban Places*. London: Routledge.
- Hall, Peter. 1999. "Changing Geographies: Technology and Income." In *High Technology and Low-Income Communities: Prospects for the Positive Use of Advanced Information Technology*, Donald Schön, Bish Sanyal, and William J. Mitchell, eds. Cambridge, MA: MIT Press, pp. 45–68.
- Harrison, Bennett, and Marcus Weiss. 1998. *Workforce Development Networks: Community-Based Organizations and Regional Alliances*. Thousand Oaks, CA: Sage Publications.
- Herzenberg, Stephen A., John A. Alic, and Howard Wial. 1998. *New Rules for a New Economy: Employment and Opportunity in Postindustrial America*. Ithaca, NY: ILR Press.
- Holzer, Harry. 1996. *What Employers Want: Job Prospects for Less Educated Workers*. Thousand Oaks, CA: Sage Publications.
- Keefe, Jeffrey, and Rosemary Batt. 1997. "Technology and Market-Driven Restructuring: United States." In *Telecommunications: Restructuring Work and Employment Relations Worldwide*, Harry C. Katz, ed. Ithaca, NY: ILR Press, pp. 31–88.
- Meléndez, Edwin. 1996. *Working on Jobs: The Center for Employment Training*. Boston: Mauricio Gaston Institute for Latino Community Development and Public Policy.
- Mitchell, William J. 1999. "Equitable Access to the Online World." In *High Technology and Low-Income Communities: Prospects for the Positive Use of Advanced Information Technology*, Donald Schön, Bish Sanyal, and William J. Mitchell, eds. Cambridge, MA: MIT Press, pp. 135–161.
- National Employment Law Project. 2000. *Workforce Investment Board Support Letter*. New York: National Employment Law Project. <http://www.nelp.org/docUploads/letter1%2Epdf> (accessed February 28, 2002).
- National Telecommunications and Information Administration (NTIA). 2000. *Falling Through the Net: Toward Digital Inclusion*. Washington, DC: National Telecommunications and Information Administration. <http://search.ntia.doc.gov/pdf/ftn00.pdf> (accessed January 3, 2002).
- Noyelle, Thierry. 1987. *Beyond Industrial Dualism: Market and Job Segmentation in the New Economy*. Boulder, CO: Westview Press.
- Osterman, Paul. 1999. *Securing Prosperity: The American Labor Market: How It Has Changed and What to Do about It*. Princeton, NJ: Princeton

- University Press.
- Parker, Eric, and Joel Rogers. 2000. "Sectoral Training Initiatives in the U.S.: Building Blocks of a New Workforce Preparation System?" In *The German Skills Machine: Sustaining Comparative Advantage in a Global Economy*, Pepper D. Culpepper and David Finegold, eds. *Policies and Institutions*, Vol 3. New York: Berghahn Books, pp. 326–362.
- Sassen, Saskia. 2001. *The Global City*. 2nd ed. Princeton, NJ: Princeton University Press.
- Schön, Donald A. 1999. "Introduction." In *High Technology and Low-Income Communities: Prospects for the Positive Use of Advanced Information Technology*, Donald Schön, Bish Sanyal and William J. Mitchell, eds. Cambridge, MA: MIT Press, pp. 1–23.
- Servon, Lisa J. 2002. *Bridging the Digital Divide: Technology, Community, and Public Policy*. Malden, MA: Blackwell Publishing.
- Swinney, Dan. 2001. "A Labor-Led Workforce Training and Education System: Practical Opportunities and Strategic Challenges." A report on the work of the Manufacturing Workforce Development Project of the Chicago Federation of Labor. *Social Policy*, 31(3): pp. 23–32.
- Takahashi, Beverly, and Edwin Meléndez. 2002. *Union-Sponsored Workforce Development Initiatives*. New York: Community Development Research Center, Milano Graduate School, New School University.
- Temin, Peter, and Louis Galambos. 1987. *The Fall of the Bell System: A Study in Prices and Politics*. Cambridge: Cambridge University Press.
- Zook, Matthew A. 2000. "The Web of Production: The Economic Geography of Commercial Internet Content Production in the United States." *Environment and Planning A* 32(3): 411–426.