

BROADBAND AND ICT ECOSYSTEM DIRECTLY SUPPORTS NEARLY 11 MILLION HIGH-PAYING U.S. JOBS

By Patrick Brogan, Vice President of Industry Analysis

An analysis of data recently issued by the Bureau of Labor Statistics (BLS) reveals that broadband and associated information and communications technology (ICT) directly support at least 10.8 million high-paying jobs in the United States. ICT represents 7.5 percent of total employment and 8.0 percent of non-farm wage and salary employment. The BLS data reflect average employment over the course of 2010.

Based on BLS projections, we estimate that ICT jobs will grow by 1.3 million to 1.5 million over ten years. The average wages paid by ICT industries and ICT-centric occupations were significantly more than national average, our analysis found. Firms in ICT industries paid an average of 37 percent greater than the national mean and 52 percent greater than the national median wage. Meanwhile, ICT-centered jobs in all firms across the economy paid approximately 41 percent greater than the national mean and 76 percent greater than the national median.

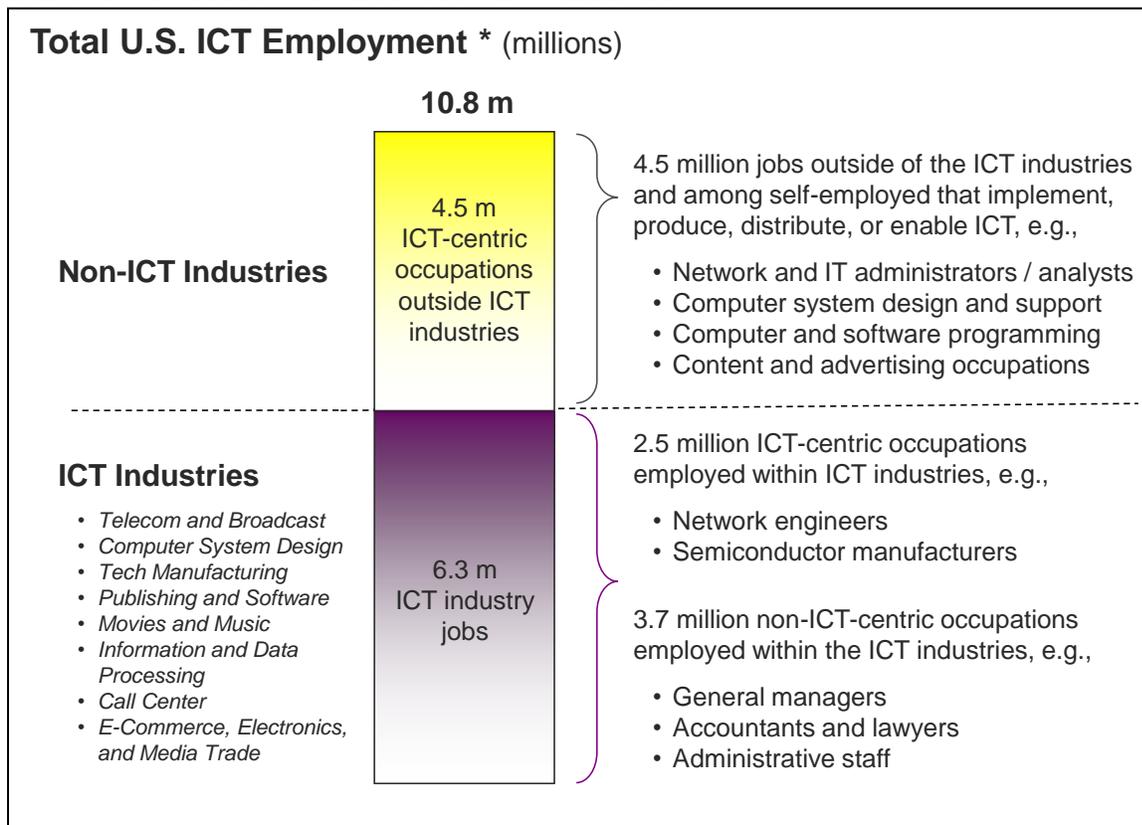
Often, technology employment studies take the perspective of either tech industries, on one hand, or tech-centered occupations—i.e., job functions—on the other hand. We attempt to capture both, while not double counting the overlap. We first identified and accounted for all employment in *ICT industries*, which might include, among others, broadband telecommunications providers, computer design consultants, or computer and electronics manufacturers. We then identified and accounted for *ICT-centric occupations*—in other words, jobs that predominantly exist to utilize, implement, produce, or distribute ICT and related information. ICT-centric occupations might include computer software programmers or network administrators.

There is some overlap since ICT-centric occupations exist in both ICT and non-ICT industries; and ICT industries hire employees in both ICT-centric occupations and non-ICT-centric occupations, such as general managers or accountants. But we were careful to not double-count the overlap. The Technical Discussion of Data and Methodology at the end of the research brief contains a complete list of the industries we identified as ICT and the occupations we considered ICT-centric. It also details our calculations and key assumptions.

ICT Accounts for Nearly 11 Million Jobs

Our analysis shows that ICT industries employ 6.3 million Americans, including 2.5 million in ICT-centric occupations and 3.7 million in other occupations. Further, we find that there were 7.0 million ICT-centric occupations, including the 2.5 million already identified in the ICT industries and 4.5 million outside of the ICT industries—mostly in wage and salary paying firms in other industries, but some among the self-employed. In total, there were 10.8 million ICT jobs, including ICT-centric and other jobs in the ICT industries plus ICT-centric jobs outside the ICT industries. (See Chart 1 below.)

Chart 1: ICT Jobs in ICT and Non-ICT Industries



Source: U.S. Department of Labor, Bureau of Labor Statistics, Occupational Employment Projections (EP) 2010-2020 and USTelecom Analysis. * These include agricultural and self-employed workers. These data do not reflect the “multiplier effect,” which accounts for jobs created or sustained beyond direct employment in the ICT industries and occupations.

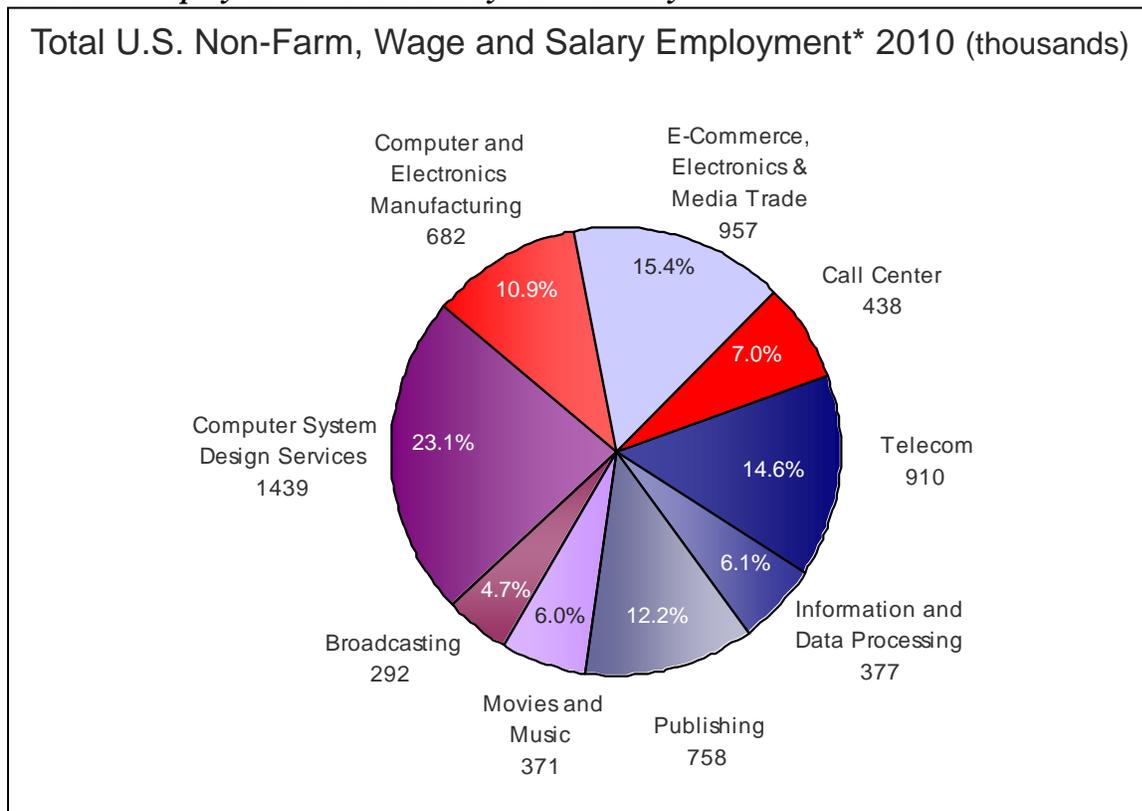
Industry Breakdowns:

Chart 2 (below) breaks out overall employment among ICT industries. It is noteworthy that the largest industry category is Computer System Design Services, which is comprised of the professional service consultants whose role is to design and implement computing and network technologies throughout the economy. Thus, the diffusion of broadband and ICT has had a significant impact on employment by creating an entire industry that employs nearly one and a half million individuals in very well-paying jobs.

Telecommunications, which includes wireline, wireless, cable, and satellite providers, and telecommunications resellers, is one of the largest employers among the ICT industries with 910,000 employees as of May 2010. Approximately half of telecom jobs are in the wireline industry and these are also among the highest-paying jobs in the industry. See “2010 Telecom Industry Breakdown and Wireline Estimate” below.

The industries listed below are largely defined by BLS, based on the 2007 North American Industrial Classification System (NAICS). However, we made several adjustments. The industry we label “E-Commerce, Electronics & Media Trade” is a category we defined to capture an amalgam of ICT industries that were scattered about the data. These include consumer electronics retailers, book and music retailers, online retailers and auction sites, business to business online markets, and electronics wholesalers and repairers. We have also adjusted the Computer and Electronics Manufacturing category to remove Navigational, Measuring, Electro-Medical, and Control Instruments industry. Industry classification is discussed in detail in the Technical Discussion of Data and Methodology below.

Chart 2 – Employment Broken Out by ICT Industry



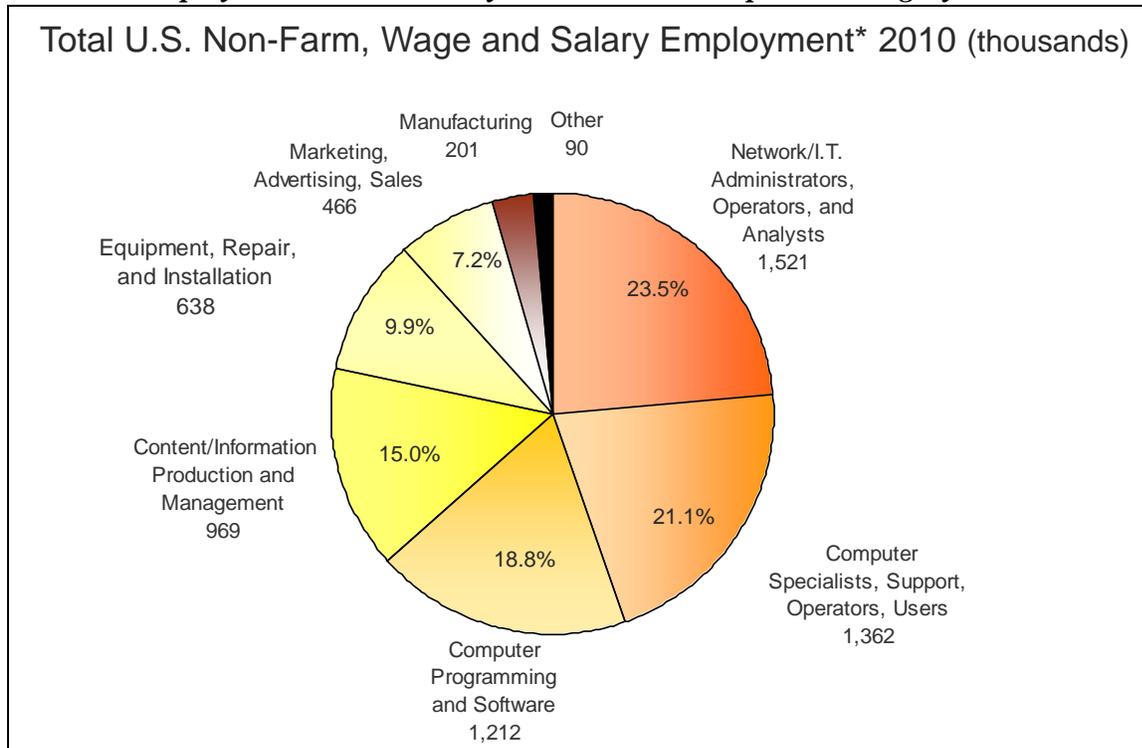
Source: U.S. Department of Labor, Bureau of Labor Statistics, Occupational Employment Statistics (OES) and USTelecom Analysis. *The OES data do not include agricultural or self-employed workers. The OES data reflect an estimated 6.2 million ICT industry employees compared to 6.3 million in the EP data.

Occupational Breakdowns:

Chart 3 below takes the 54 BLS-designated occupations that we considered to be ICT-centric and places them in categories that we assigned. Much like the ICT employment by industry

illustrates the role broadband and ICT have played in creating new industries outside of the traditional technology industries, the occupational data demonstrate how diffusion of broadband and ICT throughout the economy has generated millions of jobs. Firms throughout the economy, including non-ICT sectors such as finance, real estate, government, retail, healthcare, and others, must hire network administrators, programmers, web developers, information security analysts, and other ICT-centric employees. As noted above, ICT-centric jobs outside of ICT industries accounts for 4.5 million jobs. As we will see below, these include some of the highest-paying and fastest growing ICT jobs.

Chart 3 – Employment Broken Out by ICT-Centric Occupation Category



Source: U.S. Department of Labor, Bureau of Labor Statistics, Occupational Employment Statistics (OES) and USTelecom Analysis. *This includes 6.5 million jobs in ICT and non-ICT industries. The OES data do not capture agricultural (~2.2 million in May 2010) or self-employed (~9.0 million in May 2010) workers. If agricultural and self-employed workers were included in the analysis, total ICT-centric jobs would increase from 6.5 million to 7.0 million, mostly due to ICT-centric occupations among the self-employed. The percentage mix would not significantly change.

ICT Jobs Pay Significantly Greater than Average

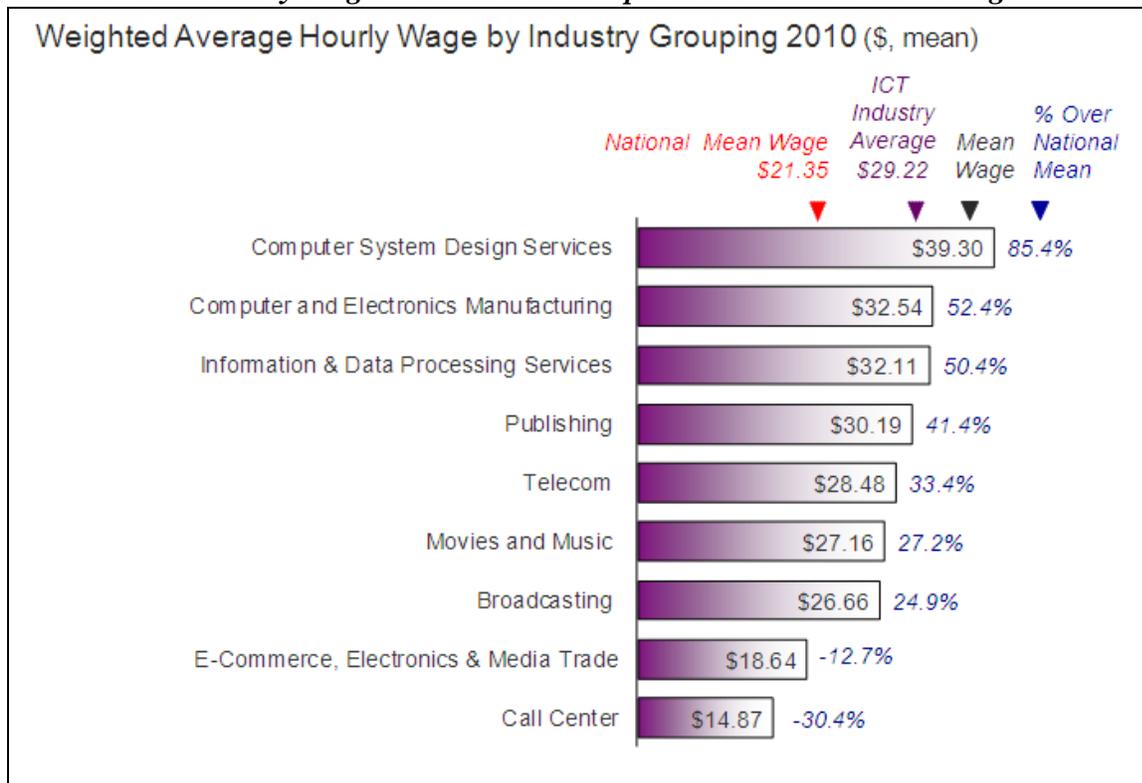
ICT Industry Wages and Rankings

We found that the average wages paid by ICT industries and ICT-centric occupations were significantly greater than national average. We looked at two measures of the “average,” mean and median. Both mean and median may be useful measures; however, the median is often used to reduce upward or downward skews in the average resulting from extremely high or extremely low earners. The national mean wage was \$21.35 per hour and the national median wage was \$16.27 per hour. We found that ICT industry jobs paid a mean of \$29.22 and a median of

\$24.79, 37 percent greater than the national mean and 52 percent greater than the national median. Excluding certain low-wage industries, such as call centers and electronics retailers, ICT industry jobs paid 53 percent greater than the national mean and 72 percent greater than the national median. Eighty-one percent of jobs in ICT industries are in industries that pay, on average, greater than the national average wage. See Chart 4 below.

Among ICT industries, the Computer and Systems Design Services industry pays the greatest wage, at 85 percent greater than the national average, computed by mean. The Computer and Electronics Manufacturing and Information and Data Processing industries are also very high, at more than 50 percent of the national average. The telecommunications industry pays 33 percent greater than average, though there is significant variation. We estimate that wireline telecommunications providers pay approximately 44 percent of the national average wage, placing it closer to the top tier. (See Chart 8 below.)

Chart 4: ICT Industry Wages Ranked and Compared to the National Average



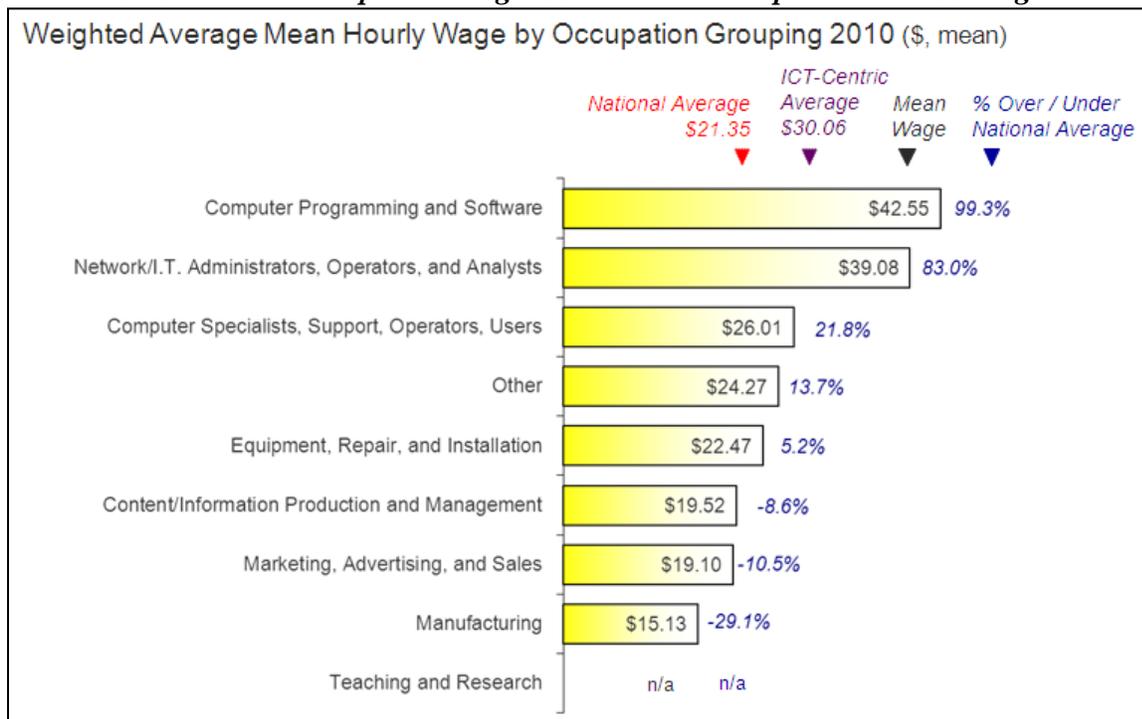
Source: U.S. Department of Labor, Bureau of Labor Statistics Occupational Employment Statistics and USTelecom Analysis. Industry average is weighted by number of employees.

ICT-Centric Occupation Wages and Rankings:

ICT-centric jobs, including those in ICT industries and those in non-ICT industries, paid a mean wage of \$30.06 and a median wage of \$28.57, which were 41 percent greater than the national mean and 76 percent greater than the national median, respectively. Seventy-one percent of ICT-centric jobs are in occupations that pay, on average, greater than the national average wage. (See Chart 5 below.)

Among ICT-centric occupations, Computer Programming and Software leads the pack, paying 99 percent greater than the national average wage, computed as a mean. Network/I.T. Administrators, Operators, and Analysts earn 83 percent more than average while Computer Specialist, Support, Operators, and Users earn 22 percent more than average. As shown in Chart 3, these occupations account for approximately 64 percent of ICT-centric jobs.

Chart 5: ICT-Centric Occupation Wages Ranked and Compared to the Average



Source: U.S. Department of Labor, Bureau of Labor Statistics Occupational Employment Statistics and USTelecom Analysis. Industry average is weighted by number of employees.

ICT Is Projected to Add 1.3 to 1.5 million Jobs from 2010 – 2020

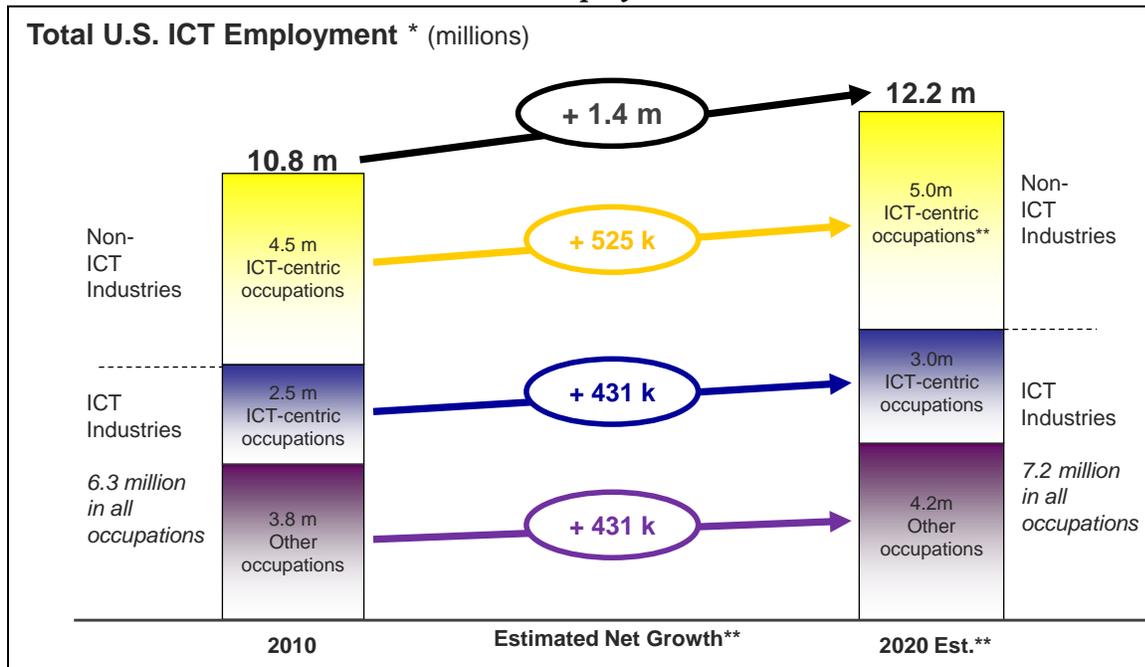
Based on BLS Employment Projections for 2010 – 2020, we estimate ICT industry jobs will grow by a net amount of approximately 860,000, and ICT-centric jobs will grow by a net amount of approximately 950,000. To get the total number of ICT jobs, we have to eliminate overlap, so we do not double count ICT-centric jobs in ICT industries. Currently, approximately 40 percent of ICT industry jobs are ICT-centric. We ran scenarios in which the percentage ranged from 40 percent to 60 percent. At 40 percent, we would eliminate 345,000 jobs from ICT-centric occupations. In this case we would add a net of approximately 610,000 ICT-centric jobs in non-ICT industries to the ICT industry growth. The result would be ten-year growth of more than 1,470,000 ICT jobs.

If a greater portion of ICT industry job growth is in ICT-centric jobs, the overlap would be greater and overall growth would be smaller. We ran scenarios in which 60 percent of ICT industry job growth was ICT-centric. This eliminated approximately 520,000 jobs, yielding a net addition of 345,000 ICT-centric jobs in non-ICT industries for a total increase of 1,300,000 ICT

jobs. In the 50 percent scenario, we would eliminate overlap of approximately 430,000 jobs. In this case, there would be a net addition of 525,000 ICT-centric occupations in non-ICT industries to ICT industry growth. The result would be a total increase of 1,385,000 ICT jobs. (See Chart 6 below.)

Thus, based on the BLS projections, if 40 percent to 60 percent of new ICT industry jobs are ICT-centric, there would be approximately 1.3 million to 1.5 million net new ICT jobs created over the next ten years. Moreover, net job growth does not account for attrition and turnover, which means there will be a greater number of job openings.

Chart 6: Estimated Growth in U.S. ICT Employment 2010 – 2020.



Source: U.S. Department of Labor, Bureau of Labor Statistics, Employment Projections (EP) 2010-20 and USTelecom Analysis. * In contrast to the Occupational Employment Statistics (OES) data, the EP data include agricultural and self-employed workers. These data also exclude a small number of ICT teaching occupations that are included in the OES data. ** This is a midpoint of scenarios with 40%-60% of ICT industry job adds ICT-centric, yielding ~1.3m to ~1.5m total ICT job adds.

In Chart 7 (below), we can also see the industry and occupational sources of ICT job growth. The overlap between ICT-centric jobs and ICT industry jobs was not readily available for this disaggregated analysis, so the figures do not eliminate overlap of ICT-centric occupations and industries. From the ICT-centric occupations perspective, of the more than 956,000 jobs expected to be added over the next ten years, 617,000, or 64 percent, are expected to come from Computer Programming and Software and Network / IT Administrators, Operators, and Analysts, the two occupations with the highest paying wages—99 percent and 83 percent greater than the average computed as a mean, respectively. The portion increases to 78 percent if you include Computer Specialists, Support, Operators, and Users, which still pay 20 percent greater than average.

From the ICT industry perspective, the vast majority of the growth comes from Computer System Design Services, which accounts for 671,000 out of 863,000 net jobs, or 78 percent of the growth. All of the remaining industries, including Telecommunications, are expected to add net jobs, except Computer and Electronics Manufacturing and Movie and Music Production. (See discussion of methodology and cautionary notes regarding the ten-year job projections in the Technical Discussion of Data and Methodology.)

Chart 7: Sources of Growth in ICT Jobs, 2010 – 2020

Total U.S. ICT Employment* (net jobs)					
Total ICT Growth Growth from Non-ICT Industries	+ 1.4 million + 525 k ICT-centric occupations	ICT-Centric Occupation (thousands of employees)	2010	2020	Growth**
		Computer Programming and Software	1,276	1,591	315
		Network/I.T. Administrators, Operators, and Analysts	1,666	1,968	302
		Computer Specialists, Support, Operators, Users	1,462	1,594	131
		Equipment, Repair, and Installation	712	810	98
		Content/Information Production and Management	1,139	1,211	73
		Marketing, Advertising, and Sales	490	537	48
		Other	33	36	4
		Manufacturing	204	190	(14)
		ICT Occupations Total	6,982	7,937	956
Growth from ICT Industries + 863k all occupations	+ 431 k ICT-centric occupations + 431 k Other occupations	Less Estimated ICT Occupations In ICT Industries**	2,541	2,972	431
		Net adds to ICT Employment from Non-ICT Industries	4,441	4,965	525
		ICT Industries (thousands of employees)	2010	2020	Growth
		Computer System Design Services	1,442	2,113	671
		Telephone call centers	419	506	87
		E-Commerce, Electronics & Media Trade	1,062	1,140	78
		Information - Telecom	900	974	74
		Information - Information & Data Processing Services	384	415	31
		Information - Broadcasting	295	325	30
		Information - Publishing	761	791	30
		Information - Movies and Music	372	347	(25)
		Computer and Electronics Manufacturing	694	580	(114)
		ICT Industries Total	6,327	7,190	863
Estimated Growth 2010-20		Sources of Growth			

Source: U.S. Department of Labor, Bureau of Labor Statistics, Employment Projections (EP) 2010-20 and USTelecom Analysis. * EP data include agricultural and self-employed workers. **This is a midpoint of scenarios with 40%-60% of ICT industry job adds ICT-centric, yielding ~1.3m to ~1.5m total ICT job adds.

Chart 8: 2010 Telecom Industry Breakdown and Wireline Estimate

As of 2008, BLS reports wireline telecommunications and cable operators combined as “Wired Telecommunications Carriers.” Therefore we must *estimate* the 2010 employees and wages for each based on the proportion of employees (76 percent wireline telecom, 24 percent cable) and hourly wages (\$28.71 wireline, \$21.05 cable) in 2007, the last year they were reported separately. We ran scenarios in which wireline retains the same or a smaller share of jobs relative to cable and the industry.

Telecom Industry	Jobs	Mean Wage	Wage % Over National Average
Wired (Wireline + Cable)	612,000	\$28.55	34%
Wireline ('10 Est. Range)	~432,000 - 455,000 ± (71% - 74% of Wired)	~\$31 ±	~44%-45%
Cable ('10 Est. Range)*	~157,000 - 180,000 ± (26% - 29% of Wired)	~\$23 ±	~5%-6%
Wireless	170,000	\$27.17	27%
Reseller and Other	117,000	\$29.74	40%
Satellite	11,000	\$31.72	48%
Telecom Total	910,000	\$28.48**	33%

Source: U.S. Department of Labor, Bureau of Labor Statistics and USTelecom Analysis. *In accordance with NAICS industry classification, cable includes only cable distribution systems and excludes cable programming, which is included in the broadcasting industry category. ** Weighted average by employees.

Technical Discussion of Data and Methodology

Data: We analyzed Bureau of Labor Statistics (BLS) data, including the annual May 2010 Occupational Employment Statistics (OES) data for 291 industry subgroups and 796 occupations and the biannual 2010-2020 Employment Projections (EP) data. The OES jobs data cover non-farm, wage and salary workers. The OES reports occupations in three tiers: industry total; major occupations; and sub groups. For some industries, occupational estimates are not reported at the lower tiers, so the sum of the sub groups (125.5 million) is less than the major groups (126.8 million), which is less than the sum of industry totals (127.1 million). 1.6 million jobs, or 1.2 percent, were not reported in a sub category. The EP data set is broader; it includes farm and self-employed workers (143.1 million total). Larger total ICT jobs figures based on EP data are primarily due to self-employed workers in ICT-centric occupations. Methodological changes compared to prior years are discussed below.

ICT Classification:

(1) *ICT Industries.* We classified all industries as information and communications technology (ICT) or not. ICT includes: (1) information industries, consisting of telecom and broadcasting, information and data processing services, publishing (including software), and movies and music; (2) computer and electronics manufacturing; (3) computer system design services; (4) call centers; and (5) e-commerce, electronics & media trade industries, e.g., electronics retailers and wholesalers; online retailers; business to business online commerce; book, periodical, and music stores; and electronics repair. Among ICT Industries in the OES data, approximately 144,000 out of 6.2 million employees, or 2.3 percent, were not classified into the sub group.

We made the following revisions in our 2010 analysis; (A) Removed the navigational, measuring, electro-medical, and control instruments from the computer and electronics manufacturing industry. (B) Added call centers. (C) Added e-commerce, electronics & media trade. In the OES, these were aggregated with non-ICT industries (e.g., home appliance, electrical). We allocated less than half of more than 2.1 million of these jobs to ICT in proportion to more granular BLS industry data (Current Employment Statistics, May 2010). (See list of ICT industries at the end of the Technical Discussion of Data and Methodology.)

(2) *ICT-Centric Occupations.* We classified certain occupations as “ICT-centric”—those that predominantly exist to utilize, implement, produce, or distribute ICT and related information; or otherwise primarily serve to integrate their organizations with the ICT ecosystem. BLS issued revised Standard Occupational Classification codes in 2010. We mapped our ICT-Centric occupations from years prior to the new classifications. (See list at the end of the Technical Discussion of Data and Methodology for occupations considered ICT-Centric under the new classification system.)

Computation of Overall ICT Employment: We define direct ICT employment as ICT industry employment in both ICT-centric and non-ICT-centric jobs, plus ICT-centric jobs in non-ICT industries.

(1) We first identified all direct employment within the ICT industries, broken out by ICT-centric and non-ICT occupations. For OES data, the industry “total” group was not broken out

into ICT-centric and non-ICT centric jobs. Therefore, we allocated it between ICT-centric and other categories in proportion to the industry's distribution within the sub group.

(2) We next identified all ICT-centric occupations based on our classification. For OES data, the "total" group was not broken out by those employed in ICT industries and those employed in other (i.e., non-ICT) industries. We allocated into ICT industry and non-ICT industry categories in proportion to the sub group distributions.

(3) To avoid double counting, we backed out ICT-centric jobs in the ICT industries, since they were already counted in the ICT industry totals. We then summed the ICT industry job totals, both ICT-centric and other, with the ICT-centric jobs in non-ICT industries.

Impact of Reclassification of ICT Industries and Occupations:

In this analysis we relied more heavily on EP data, whereas in the past, we have relied primarily on OES data. So, the discussion that follows, which compares results of different methodologies, is based on ready comparisons to OES data. As a result of our revised ICT industry definitions, we subtracted more than 404,000 navigational, measuring, electro-medical, and control instruments manufacturing jobs, while adding 438,000 call centers jobs and 957,000 e-commerce, electronics & media trade jobs. Our new industry definitions resulted in an increase of approximately 1 million ICT industry jobs. However, we must net out approximately 200,000 ICT-centric jobs that would have otherwise been counted as ICT-centric occupations in non-ICT industries, but are now accounted for in the ICT industry category. Thus, compared to the old definitions, there was a net increase of approximately 800,000 total ICT jobs (to 10.2 million from 9.4 million).

We assume the BLS occupational code revisions are neutral. While we cannot test this assumption directly, it is useful to compare 2009 to 2010 OES data, holding industry definitions constant. Under our old definitions, May 2010 data yield 9.4 million ICT jobs, 100,000 less than the 9.5 million ICT jobs in the May 2009 data. The small decline is consistent with the 1.2 million private non-farm wage and salary jobs lost from May 2009 to May 2010. But we must be cautious in making the comparison because the May 2009 and May 2010 survey data are not directly comparable. (See "Time Series" below).

While our new ICT industry definitions increased the number of jobs considered ICT, they also decreased the average wages for the ICT industries. Thus, under the new definitions, ICT industries pay 37 percent greater than the national mean and 52 percent greater than the national median wage. Without low-wage industries, such as call centers and electronics and media retailers, ICT industries pay approximately 53 percent greater than the national mean and 72 percent greater than the national median wage.

Cautionary Notes:

Time Series: The BLS OES and EP data are based on sampling and therefore not well suited to time series comparisons. This is especially true since, after 2007, BLS used revised industry categories, moving from NAICS 2002 to NAICS 2007; and for years after 2009, BLS revised occupational codes, moving from SOC 2000 to SOC 2010. It did not issue historical revisions in either case. Further, USTelecom made the methodological adjustments discussed above. (See *ICT Classification*.)

Use of Employment Projections: The EP 2020 data are ten-year projections based on an assumed return to full employment. These projections are subject to a level of uncertainty because we cannot project economic cycles with precision. One must also consider the impact of the recent economic downturn on 2010 as a starting point when interpreting growth projections.

Conservative Approach: We believe our approach is conservative overall. On one hand, in attempting to identify *direct* ICT employment, our industry and occupational classifications are fairly broad. (See lists below.) We include more traditional technology and media industries (e.g., book and music producers and retailers) and occupations (graphic artists, advertising agents) that are integrating or competing with new technologies. On the other hand, we exclude many occupations and industries that are heavily dependent on broadband networking and information technology. For example, according to some surveys, more than [95% of businesses have adopted broadband](#). Furthermore, we have limited our study to identifying *direct* employment in the industries and occupations we identify as ICT. Neither the data we use, nor our methodology, attempts to capture the so-called “multiplier effect,” which measures jobs created or sustained beyond direct employment in ICT industries. For example, a multiplier effect analysis might attempt to measure the ripple effects on economic output and employment as ICT employees spend their earnings and it flows throughout the economy.

List of ICT Industries

- Call Center
 - Computer and Electronics Manufacturing, except Navigational, Measuring, Electro-Medical, and Control Instruments
 - Computer System Design Services
 - Information
 - Telecommunications
 - Broadcasting
 - Publishing (including Software)
 - Movies and Music Production
 - Information and Data Processing
 - E-Commerce, Electronics, and Media Trade
- We developed this category to capture certain ICT industries that were scattered throughout the OES data. Many were aggregated in broad categories with non-ICT industries, so we used more granular Current Employment Statistics (CES) for May 2010, to allocate portions of the aggregated categories to ICT as follows:
- Electrical and Electronic Goods Merchant Wholesalers (5%)
 - Wholesale Electronic Markets and Agents and Brokers (28%)
 - Electronics and Appliance Stores (88%)
 - Book, Periodical, and Music Stores (100%)
 - Electronic Shopping and Mail-Order Houses (70%)
 - Electronic and Precision Equipment Repair and Maintenance (73%)

List of ICT-Centric Occupations

The occupations are based on 2010 Standard Occupational Classifications. USTelecom created the *italicized categories* and assigned occupations to these categories.

Computer Programming and Software

- Computer Programmers
- Software Developers, Applications
- Software Developers, Systems Software
- *Computer Specialists, Support, Operators, Users*
- Computer Hardware Engineers
- Computer Operators
- Computer Support Specialists
- Data Entry Keyers
- Database Administrators
- Word Processors and Typists
- Computer Occupations, All Other
- Computer and Information Research Scientists

Content/Information Production and Management

- Archivists
- Broadcast News Analysts
- Broadcast Technicians
- Camera Operators, Television, Video, and Motion Picture
- Desktop Publishers
- Film and Video Editors
- Graphic Designers
- Librarians
- Library Assistants, Clerical
- Library Technicians
- Motion Picture Projectionists
- Radio and Television Announcers
- Sound Engineering Technicians
- Printing Press Operators
- Print Binding and Finishing Workers
- Audio-Visual and Multimedia Collections Specialists

Equipment, Repair, and Installation

- Audio and Video Equipment Technicians
- Camera and Photographic Equipment Repairers
- Computer, Automated Teller, and Office Machine Repairers
- Electronic Equipment Installers and Repairers, Motor Vehicles
- Electronic Home Entertainment Equipment Installers and Repairers
- Media and Communication Equipment Workers, All Other
- Radio Operators

Equipment, Repair, and Installation (cont'd)

- Security and Fire Alarm Systems Installers
- Telecommunications Equipment Installers and Repairers, Except Line Installers
- Telecommunications Line Installers and Repairers
- Radio, Cellular, and Tower Equipment Installers and Repairs

Manufacturing

- Electrical and Electronic Equipment Assemblers
- Semiconductor Processors

Marketing, Advertising, and Sales

- Advertising and Promotions Managers
- Advertising Sales Agents
- Telemarketers

Network/I.T. Administrators, Operators, and Analysts

- Communications Equipment Operators, All Other
- Computer and Information Systems Managers
- Computer Systems Analysts
- Switchboard Operators, Including Answering Service
- Telephone Operators
- Network and Computer Systems Administrators
- Information Security Analysts, Web Developers, and Computer Network Architects

Other

- Media and Communication Workers, All Other

Teaching and Research

- Communications Teachers, Postsecondary
- Computer Science Teachers, Postsecondary
- Library Science Teachers, Postsecondary