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**The Information and Communication
Technologies & Digital Media**

Sector Navigation Team

CALIFORNIA COMMUNITY COLLEGES

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Information Technology Technician Pathway Labor Market Analysis



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Foreword

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As Information Technology Networking (not to be confused with software development) continues to grow it gets more specialized, requires more experience and training. Meanwhile under-represented minorities and women are less frequently entering this STEM rewarding career.

Students who want to get an entry-level job in computer support or network information technology quickly, without a 4 year degree, to meet their financial needs and then build on that entry level job to make a career would need a sequence of job/credential building steps such as an IT Pathways guide.

Information Technology Technician Pathway (ITTP) Development Methodology

For the past two years much research and discussion with experts went into the development of the ITTP. Initially, IT entry level qualifications based upon Burning Glass real-time jobs data clearly indicated that 80% of advertised IT jobs required a Bachelor's degree and another 15% a Master's degree. These criteria seemed to fly in the face of a 'general wisdom' among IT experts at the Mid-Pacific Information Communication Technologies Center (MPICT) that certifications (Cisco, CompTIA, MS etc.) were the key to jobs. It also questioned the relevancy of the whole California Community Colleges (CCC) IT Career and Technical Education (CTE) program.

Troubled by this major disagreement, Steve Wright, Sector Navigator, ICT-Digital Media, sought out John Reed, Sr. Vice President, Robert Half Technology whose department places thousands of IT personnel annually (about 50% are for Help Desk and User Support jobs). John said neither degrees nor certifications are as important as ten years of experience which trumps all.

It was clear that we had a hybrid - experience based - branded pathway to develop.

To further explore the criteria, the Bay Area Community College Consortium (BACCC) hosted a full day employer 'marketplace' focus group to study the hiring needs for Computer Support Technicians. While the emphasis was on the Help Desk and User Support functions, the question of experience came up often. It was a sidebar discussion with a placement agency where the statement was made "when you recruit you just go to a Geek Squad- Best Buy or Apple Store and recruit someone from behind the counter."

Serendipitously, through an MPICT/Centers of Excellence (COE) study of the economic impact of ICT on the Bay Region economy a surprising number of Retail jobs associated with ICT were discovered. Pursuant to that, Sandy Jones, DSN- East Bay, conducted an in-depth phone survey with computer retail outlets (Apple Store, Microsoft Store, Best Buy, Staples, Office Depot, Office Max and Costco), which indicated that a combination of high school education, customer service, and basic computer operating system familiarity was all that was required for entry-level employment. Subsequent interviews with cellular stores like ATT and Verizon indicated a higher bar.

The outlines of a self-starter career pathway were becoming clear. Stackable credentials, coupled with recognized certifications could be matched with the "marketplace" pathway and packaged statewide in the CCC system. All would be built around the students work experience, which due to career

advancement and their own finances, needed to start very quickly. Labor market information for the relevant job titles were re-confirmed through the COE (2014 and 2015).

The design and vetting was not complete. The California Community Colleges IT Model Curriculum with its base of C-ID designated courses would be the tent-pole of the ITTP, however variations needed to exist to enable students' quicker entry into jobs where they could gain experience.

Presentations of the concept followed at the MPICT winter conference in San Francisco, the IT Certification Council (leadership for IBM, Cisco, CompTIA, MS) – in Chicago, and locally with Kaiser IT, WASTC, Microsoft Channel Partners and the Subject Matter Expert advisory team at CompTIA. The Doing What Matters Retail and Hospitality Sector Team became a valuable research and support partner as we explored the alternate IT retail and retail management paths. To all involved in this process and many select Faculty and Deans we owe true appreciation for this pathway design.

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Introduction

Information Technology (IT) is a vast and varied sector and job opportunities exist within the IT sector for workers who possess various levels of education and training. From entry-level to management, the IT Sales and IT Technician Pathways are opportunities for students to explore occupations and advance their skills and knowledge.

This research brief examines the opportunity for employment in IT Pathways by relating the occupations, expected wages, knowledge, skills and abilities, as well as employer job advertisement data for each of the occupational steps within the Pathways.

Occupations included in this study were selected by the California Community Colleges' Sector Navigator for Information and Communications Technologies (ICT)/Digital Media (DM) for their relevance to the IT Pathways and California Community College program offerings. Industries included in this brief were chosen based on the likelihood of employing the selected occupations. The region of study is the state of California.

This study also identified occupations related to the pathways described herein. For reference, data on wages, current and projected jobs, and required level of education for the related occupations can be found in Appendix E.

Analysis provided herein was conducted based on industry and occupation data extracted from Economic Modeling Specialists, International (EMSI) and Labor Insight: Burning Glass. For more information on the data sources see Appendix A.

This labor market report compliments and supports the IT Technician Pathway developed by the ICT/DM state-wide Sector Navigator, Steve Wright. For more information about this Pathway and how community colleges can list relevant course offerings that correspond to the IT Technician Pathway, visit: <http://ict-dm.net/itp>

Information Technology Industry Overview

Information and Communications Technologies (ICT) industries are primarily involved in production, support, and service of computer hardware, software,

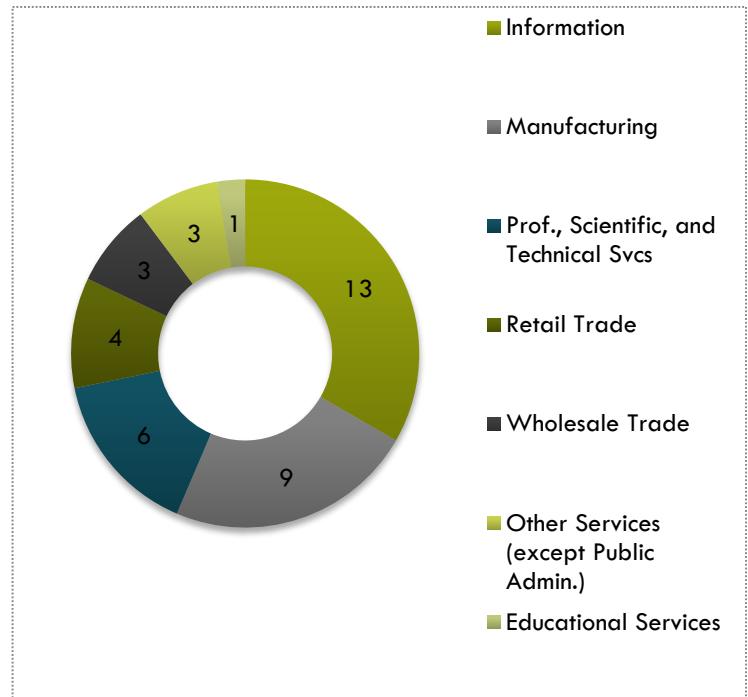
communication and operating systems and applications, and infrastructures. Even industries that are not developers of ICT related technologies, products, and services still make use of ICT in their work. Productivity tools, communications media, process tools, accounting, and sales are all resources and applications that are ICT driven. These ancillary ICT tools and resources are used in many industries, such as healthcare, education, agriculture, and manufacturing.¹

For this study, 39 ICT industries were identified as the primary employers for occupations within the IT Technician Pathway. A complete list of industries and detailed labor market data can be found in Appendix B.

In 2014, there were 73,442 establishments in California that represented the 39 industries. The industries with the most businesses were Scientific and Technical Consulting Services (20,406) and Custom Computer Programming Services (11,790). These two industries represented 40% of all establishments in the state. Conversely, Blank Magnetic and Optical Recording Media Manufacturing and Switchgear and Switchboard Apparatus Manufacturing had the least number of establishments, with a total of 21 and 55 establishments, respectively.

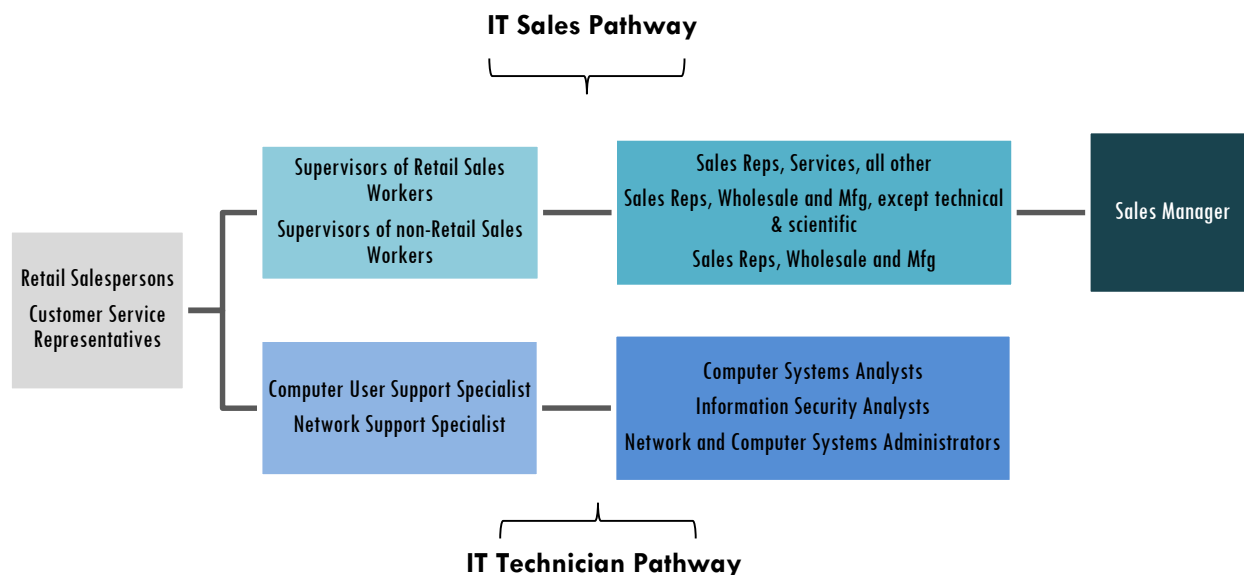
Over the next four years, ICT industries are expecting significant job growth, 115,000 new jobs by 2019. Industries with largest job growth in absolute terms are Scientific and Technical Consulting Services (37,719 jobs), Customer Computer Programming Services (21,673 jobs), and Computer System Design Services (17,026 jobs). Combined, these industries, are anticipating adding new jobs numbering over 76,000 over the next five years.

Figure 1 - Major Industry Sector Representation



¹ Mid-Pacific Information and Communications Technologies Center (MPICT)

Pathways and Occupations



IT Sales Pathway

The IT Sales Pathway is one possible career track for students interested in working as front-line employees handling customer requests and solving problems. Entry into this pathway begins with retail salesperson and customer service representative occupations, progressing to supervisory and sales positions and eventually leading to management occupations. For this study, only the occupational employment from the 39 ICT industries identified as the primary employers above were counted. These employers are primarily within Computer and Wireless industries. Therefore the employment numbers reported for the occupations in the IT Sales Pathway are a sub-set of total employment for these occupations.

Step 1: IT Sales entry-level occupations (Retail Salespersons and Customer Service Representatives) require only a high school education or less for employment and number tens of thousands of jobs across the state. In 2014, there were more than 74,000 jobs for retail salespersons and customer service representatives combined within Computer and Wireless industries in California (see Table 1). These occupations tend to experience high rates of employee turnover which equate to significant numbers of annual job openings for workers.²

Step 2: The next step in the IT Sales Pathway is in a supervisory capacity. Supervisors in both retail and non-retail settings generally need only a high-school education for employment with the additional requirement of at least five years of work experience. At this level, there are fewer job opportunities but the potential for higher wages. These occupations combined have over 16,000 jobs within Computer and Wireless industries in California in 2014 and over 400 average annual openings over the next five years.

Step 3: Advancement in the IT Sales Pathway occurs with employment in a sales representative occupation. Sales Representatives can sell products for wholesalers or manufacturers and would need to have in-depth knowledge of the goods they are selling. In the state, there were more than 67,000 jobs for sales representatives within Computer and Wireless industries in 2014. Sales occupations commonly earn a

² It can be difficult to estimate replacement jobs accurately in high turnover occupations, so it is possible that total annual openings may be higher than estimated.

base wage plus commission; base hourly wages for these occupations range from \$25.53 to \$37.56. The education requirement for Sales Representatives occupations is typically a Bachelor's degree.

Step 4: Becoming a Sales Manager is the final step in the IT Sales Pathway. In California, the count of Sales Managers jobs within Computer and Wireless industries is greater than 11,000, with nearly 400 average annual openings over the next five years. Individuals in these positions typically possess a Bachelor's degree and earn an average hourly wage of \$55.86.

For more detailed occupational data see Appendix C.

Table 1: IT Sales Pathway Occupation Table

	Occupation	2014 Jobs	Annual openings (2014-2019)	Median Hourly Earnings
Step 1	Retail Salespersons	41,788	1,450	\$10.85
	Customer Service Representatives	32,351	1,672	\$17.57
Step 2	First-line Supervisors of Retail Sales Workers	10,182	230	\$17.36
	First-line Supervisors of non-Retail Sales Workers	6,384	177	\$24.77
Step 3	Sales Reps, Wholesale and Mfg, Except Technical and Scientific Products	12,530	297	\$25.53
	Sales Reps, Services, All Other	36,058	1,699	\$27.20
	Sales Reps, Wholesale and Mfg, Technical and Scientific Products	18,481	770	\$37.56
Step 4	Sales Managers	11,119	383	\$55.86
	Total	168,893	6,678	\$27.09

Source: Economic Modeling Specialists, International (EMSI), 2015.1

IT Technician Pathway

For students who are more inclined to technical work, the IT Technician Pathway is another option for entering the workforce and progressing to higher level occupations. Starting with an introduction to the labor market as front-line employees, this career track moves to IT technical support and finally progresses to analyst and administrator level occupations. Students interested in this pathway can begin with a two-year education then attain certifications and/or a four-year education to move along this pathway.

Step 1: Similar to the IT Sales Pathway, the IT Technician Pathway begins with entry into the labor market as a Retail Salesperson or Customer Service Representative. See Step 1 in the IT Sales Pathway above for more detail.

Step 2: Support Specialist occupations assist users of computers and related equipment by installing hardware, trouble-shooting issues and resolving them either in person or remotely. To be a qualified job candidate for these positions some college or an Associate degree is required. Support occupations permeate the California labor market, counting nearly 95,000 jobs in 2014. A significant increase in hourly wages can be obtained by transitioning from retail sales or customer service representative into support specialist positions. Median hourly wages are reported as \$25.86 and \$35.43 (see Table 2).

Step 3: With the acquisition of a Bachelor's degree and some years of work experience, an IT Technician can advance to a career as a Computer Systems or Information Security Analyst or Network and Computer

Systems Administrator. These advanced IT Technician occupations earn median wages of between \$40.00 and \$50.00 per hour. In 2014, there were an estimated 126,000 jobs for analysts and administrators in the state. Over the next five years, job openings for these positions are expected to number over 4,700 each year.

For more detailed occupational data see Appendix D.

Table 2: IT Technician Pathway Occupation Table

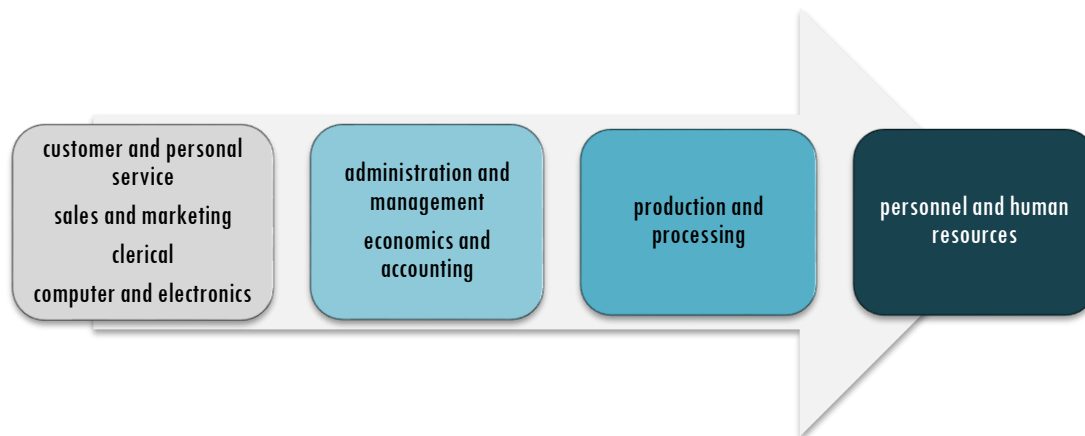
	Occupation	2014 Jobs	Annual openings (2014-2019)	Median Hourly Earnings
Step 1	Retail Salespersons	41,788	1,450 ³	\$10.85
	Customer Service Representatives	32,351	1,672 ⁴	\$17.57
Step 2	Computer User Support Specialists	73,101	2,794	\$25.86
	Computer Network Support Specialists	21,284	557	\$35.43
Step 3	Network and Computer Systems Administrators	45,220	1,389	\$39.36
	Computer Systems Analysts	72,456	2,903	\$41.37
	Information Security Analysts	8,939	480	\$48.55
	Total	295,139	11,245	\$31.28

Source: Economic Modeling Specialists, International (EMSI), 2015.1

Knowledge, Skills and Abilities (KSAs)

IT Sales – knowledge areas

As workers move through the IT Sales Pathway, the knowledge areas required for the occupations build to more refined areas. Entry-level occupations require knowledge of customer service and computers and electronics. The next occupational step adds administration/management and knowledge of economics and accounting. Production and processing are important for step three occupations, and finally personnel and human resources are required for sales managers.

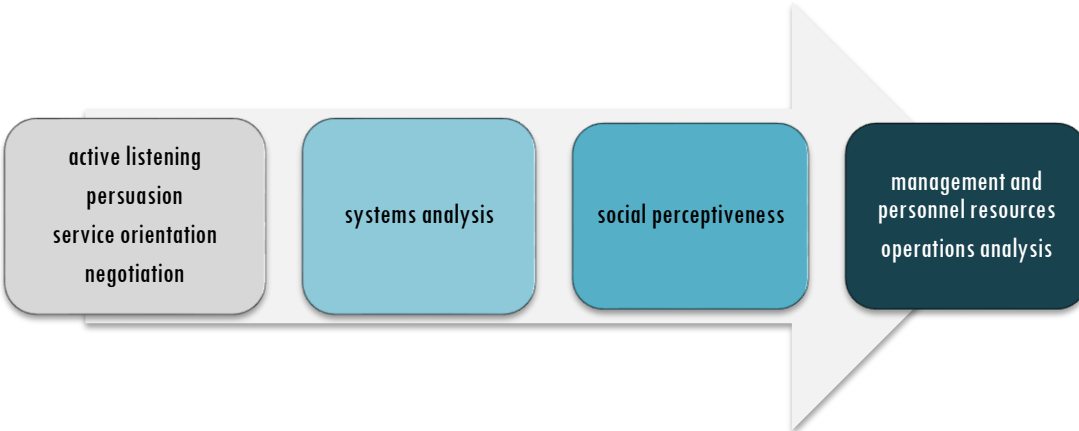


³ Duplicated Annual openings number from the IT Sales Pathway Occupation Table

⁴ Duplicated Annual openings number from the IT Sales Pathway Occupation Table

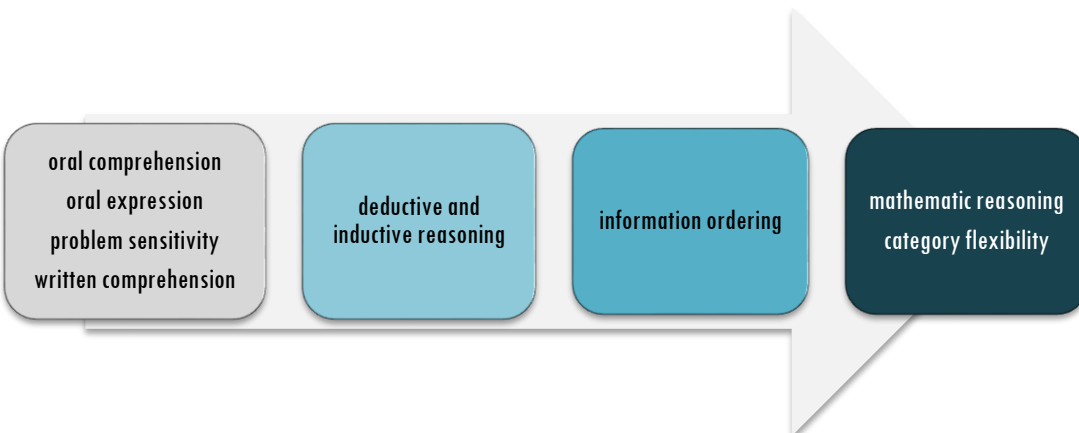
IT Sales – skills areas

Since employees who enter this IT Sales Pathway will be expected to interact regularly with the public, they need to be able to listen carefully, as well as be persuasive and effective negotiators. As they move up this pathway, they will not only need to know how changes in conditions, operations, and the environment will affect outcomes, but also how to handle situations when problems arise. Once a manager, employees will need to analyze operational needs and direct and manage staff.



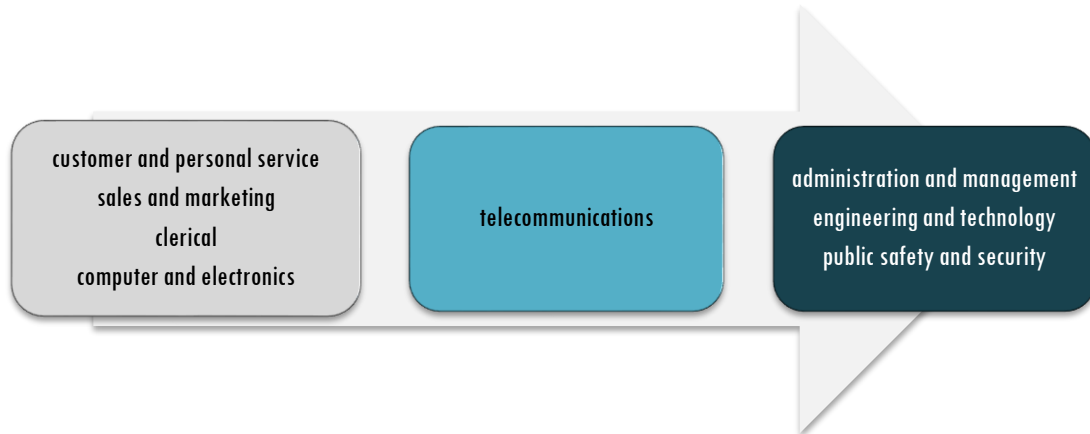
IT Sales – abilities

Those interested in the IT Sales Pathway must have the ability to effectively communicate, both in writing and verbally. They should also be able to put different pieces of information together and know how to arrange things or actions in a functional order. As sales managers, workers will also be required to apply reasoning to situations and seamlessly operate between tasks.



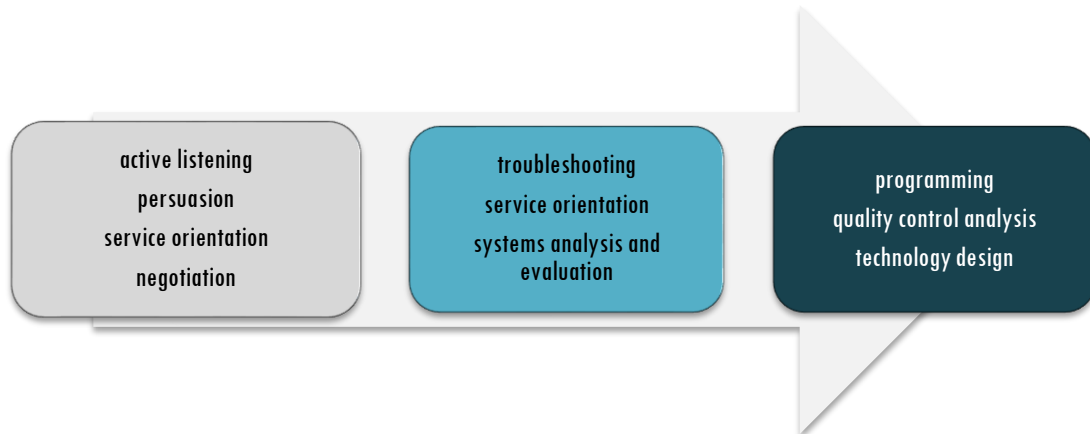
IT Technician – knowledge areas

The entry-level sales and customer service occupations in the IT Technician Pathway require knowledge of computers and electronics, sales and marketing, customer and personal service, and telecommunications. Movement into higher level occupations in this pathway necessitates an understanding of engineering and technology, public safety and security, and business and management principles involved in production methods, coordination of people and strategic planning.



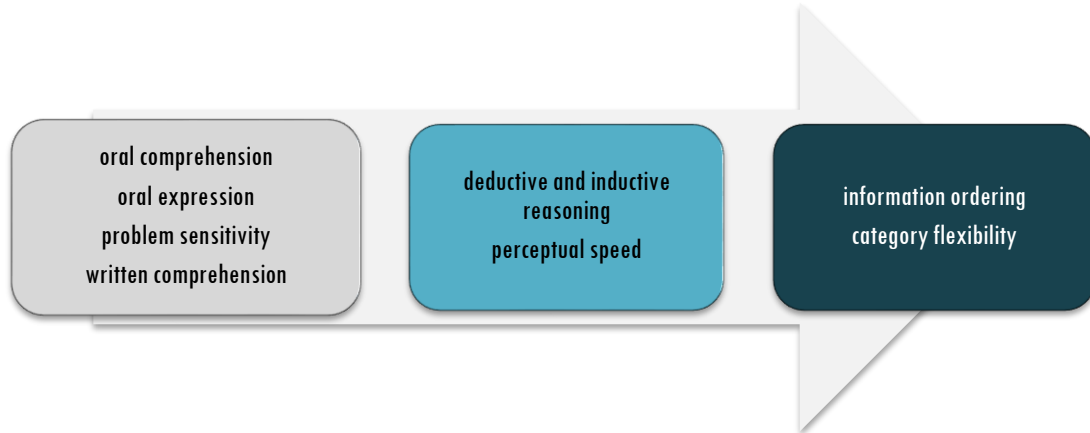
IT Technician – skills areas

Similar to the IT Sales Pathway, students interested in the IT Technician field need to communicate well with others, and be persuasive and effective negotiators. However, in this technical pathway a qualified employee must also be able to troubleshoot and be service oriented. At the last level of this pathway, analysts and administrators must also be skilled in programming, design of technology, and quality control analysis.



IT Technician – abilities

Entry-level jobs in the IT Technician Pathway require the ability to problem-solve and be effective communicators. Support occupations will need reasoning abilities and as they become analysts or administrators, they will need to quickly compare similarities and differences among different sets of information.



Based on the knowledge, skills, and abilities of the occupations in these two pathways, additional occupations were identified (see Appendix E). These occupations are intended to give students options for employment in positions that would have comparable requirements for employment and pay similar wages.

Conclusion

As nearly every industry sector and individual becomes increasingly dependent on computers, Information and Communications Technologies are vital for productivity, efficiency, connectivity and growth. ICT occupations in California are attractive career options, especially since this industry has a presence within virtually all industries throughout the state. Not only are there a number of established jobs within California, but industry experts anticipate the addition of over 76,000 jobs in ICT industries over the next five years.

This report identifies two pathways for exploration within the ICT sector: IT Sales and IT Technician. Movement through these pathways requires the continued acquisition of education, knowledge, skills, and certifications.

The IT Sales Pathway is geared towards students who have an interest in working on the front-line with customers and helping them solve their ICT problems. There are a large number (over 3,000) of annual openings within the entry-level jobs recommended for this pathway (Customer Service Representative or Retail Salesperson), allowing plenty of job opportunities for students interested in this field. Students can move up through the pathway, eventually becoming Sales Managers and receive median hourly wages of \$55.86. Students will need people and managerial skills to excel in this pathway, as well as the ability to effectively communicate and think analytically.

The IT Technician Pathway is an option for students who are interested in the technical side of the ICT industry. The entry-level positions are in-line with the ICT Sales Pathway, but the occupations differ greatly as students work their way through the outlined occupations such as Computer Support Specialists and Systems Administrators. The number of annual openings within the higher-level jobs of the ICT Technician Pathway total over 8,000 and Analysts can earn a median hourly salary of up to \$48.55. Candidates for this pathway need to be service oriented and able to troubleshoot, as well as understand the principles of engineering and technology.

Appendix A – Data Sources

Data Sources

EMSI is a proprietary resource that combines multiple sources of publically available data. Information can be customized and sorted by factors like zip code, county, and time period.

EMSI's occupation data are based on EMSI's industry data and regional staffing patterns taken from the Occupational Employment Statistics program (U.S. Bureau of Labor Statistics). Wage information is partially derived from the American Community Survey.

In order to capture a complete picture of industry employment, EMSI basically combines covered employment data from Quarterly Census of Employment and Wages (QCEW) produced by the Department of Labor with total employment data in Regional Economic Information System (REIS) published by the Bureau of Economic Analysis (BEA), augmented with County Business Patterns (CBP) and Nonemployer Statistics (NES) published by the U.S. Census Bureau. Projections are based on the latest available EMSI industry data, 15-year past local trends in each industry, growth rates in statewide and (where available) sub-state area industry projections published by individual state agencies, and (in part) growth rates in national projections from the Bureau of Labor Statistics.

Burning Glass Labor/Insight is an interactive, report-generating application that gives users real-time access to a comprehensive database of job postings data. It is powered by Burning Glass' unique technology for demand data aggregation, parsing, extraction and analysis, which translates free text job postings into actionable intelligence on the nature and content of employer demand.

Appendix B – Information Communications and Technologies Industries

NAICS	Description	2014 Establishments	2014-2019 Change
334111	Electronic Computer Manufacturing	157	6,047
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing	166	(2,056)
334210	Telephone Apparatus Manufacturing	86	(3,208)
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	271	3,012
334290	Other Communications Equipment Manufacturing	104	(541)
334310	Audio and Video Equipment Manufacturing	143	(1,391)
334413	Semiconductor and Related Device Manufacturing	555	(1,588)
334613	Blank Magnetic and Optical Recording Media Manufacturing	21	1,870
335313	Switchgear and Switchboard Apparatus Manufacturing	55	(30)
423430	Computer and Computer Peripheral Equipment and Software Merchant Wholesalers	1,430	2,160
423690	Other Electronic Parts and Equipment Merchant Wholesalers	2,089	(125)
425110	Business to Business Electronic Markets	508	(3,024)
443142	Electronics Stores	4,661	(1,882)
453210	Office Supplies and Stationery Stores	1,127	(855)
454111	Electronic Shopping	1,812	7,493
454112	Electronic Auctions	90	1,532
511210	Software Publishers	1,241	8,587
512110	Motion Picture and Video Production	5,603	10,825
512191	Teleproduction and Other Postproduction Services	728	1,078
515111	Radio Networks	186	(249)
515120	Television Broadcasting	298	1,434
517110	Wired Telecommunications Carriers	2,228	1,747
517210	Wireless Telecommunications Carriers (except Satellite)	1,103	(321)
517410	Satellite Telecommunications	154	(2,196)
517911	Telecommunications Resellers	348	(4,322)
517919	All Other Telecommunications	253	1,382
518210	Data Processing, Hosting, and Related Services	1,291	296
519130	Internet Publishing and Broadcasting and Web Search Portals	1,581	9,696
519190	All Other Information Services	75	1
541430	Graphic Design Services	2,361	238
541511	Custom Computer Programming Services	11,790	21,673
541512	Computer Systems Design Services	8,062	17,026
541513	Computer Facilities Management Services	230	1,543
541519	Other Computer Related Services	1,052	2,071
541690	Other Scientific and Technical Consulting Services	20,406	37,719
611420	Computer Training	140	(476)
811211	Consumer Electronics Repair and Maintenance	204	(117)
811212	Computer and Office Machine Repair and Maintenance	716	557
811213	Communication Equipment Repair and Maintenance	125	(28)
	Total	73,442	115,574

Appendix C – IT Sales Pathway Detailed Occupation Data

SOC	Occupation	2014 Jobs	2019 Jobs	5-year Change	5-year Change %	Annual Openings	Median Hourly Earnings	Estimate Annual Replacements
41-2031	Retail Salespersons	41,788	41,874	86	0.2%	1,450	\$10.85	1,433
43-4051	Customer Service Representatives	32,351	35,948	3,597	11%	1,672	\$17.57	952
41-1011	First-Line Supervisors of Retail Sales Workers	10,182	9,952	(230)	(2%)	230	\$17.36	230
41-1012	First-Line Supervisors of Non-Retail Sales Workers	6,384	6,545	161	3%	177	\$24.77	145
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	18,481	19,724	1,243	7%	770	\$37.56	521
41-3099	Sales Representatives, Services, All Other	36,058	39,354	3,296	9%	1,699	\$26.87	1,040
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	12,530	12,632	102	1%	297	\$25.53	276
11-2022	Sales Managers	11,119	11,792	673	6%	383	\$55.86	248

Appendix D - IT Technician Pathway Detailed Occupation Data

SOC	Occupation	2014 Jobs	2019 Jobs	5-year Change	5-year Change %	Annual Openings	Median Hourly Earnings	Estimate Annual Replacements
41-2031	Retail Salespersons	41,788	41,874	86	0.2%	1,450	\$10.85	1,433
43-4051	Customer Service Representatives	32,351	35,948	3,597	11%	1,672	\$17.57	952
15-1151	Computer User Support Specialists	73,101	80,938	7,837	11%	2,794	\$25.86	1,226
15-1152	Computer Network Support Specialists	21,284	22,344	1,060	5%	557	\$34.88	345
15-1142	Network and Computer Systems Administrators	45,220	48,268	3,048	7%	1,389	\$39.36	780
15-1121	Computer Systems Analysts	72,456	80,862	8,406	12%	2,903	\$41.37	1,222
15-1122	Information Security Analysts	8,939	10,556	1,617	18%	480	\$48.55	157

Appendix E - Related occupations

Occupations related to the initial IT Sales and IT Technician pathways occupations were identified based on similar competencies. These occupations typically require the same level of education and prior work experience and earn comparable wages.

IT Sales Related Occupations

Step 1: Retail Salespersons, Customer Service Representatives

Related Occupation	2014 Jobs	Annual Openings (2014-2019)	Median Hourly Earnings
Counter and Rental Clerks	1,912	48	\$11.96
Interviewers, Except Eligibility and Loan	839	78	\$18.62
Bill and Account Collectors	1,665	66	\$17.89
Billing and Posting Clerks	2,306	88	\$17.64
Receptionists and Information Clerks	2,373	88	\$13.88

Step 2: First-line Supervisors of Retail and non-Retail Sales Workers

Related Occupation	2014 Jobs	Annual Openings (2014-2019)	Median Hourly Earnings
First-Line Supervisors of Office and Administrative Support Workers	10,249	335	\$26.50

Step 3: Sales Representatives, Wholesale, Manufacturing, and all other products

Related Occupation	2014 Jobs	Annual Openings (2014-2019)	Median Hourly Earnings
Advertising Sales Agents	5,506	231	\$24.65
Writers and Authors	4,093	78	\$24.78

Step 4: Sales Managers

Related Occupation	2014 Jobs	Annual Openings (2014-2019)	Median Hourly Earnings
Marketing Managers	9,090	404	\$65.94
Financial Managers	6,871	309	\$58.47
Producers and Directors	24,858	1,398	\$40.28
Human Resources Managers	1,774	97	\$52.27

IT Technician Related Occupations

Step 1: Retail Salespersons, Customer Service Representatives

(see content in IT Sales pathway discussion above)

Step 2: Computer Support Specialists

Related Occupation	2014 Jobs	Annual Openings (2014-2019)	Median Hourly Earnings
Electrical and Electronics Engineering Technicians*	21,567	474	\$29.66

Step 3: Analysts and Administrators

Related Occupation	2014 Jobs	Annual Openings (2014-2019)	Median Hourly Earnings
Database Administrators*	12,269	507	\$43.20
Computer Occupations, All Other*	22,215	655	\$40.66
Software Developers, Systems Software*	82,381	2,581	\$55.82

*2014 jobs for these occupations are representative of employment in all industries in California.

More About the Centers of Excellence

The Centers of Excellence for Labor Market Research deliver regional workforce research and technical expertise to California community colleges for program decision making and resource development. We aspire to be the leading source of regional workforce information and insight for California community colleges.

More information about the Centers of Excellence is available at www.coecc.net. This document and others are available to download at www.coecc.net.

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