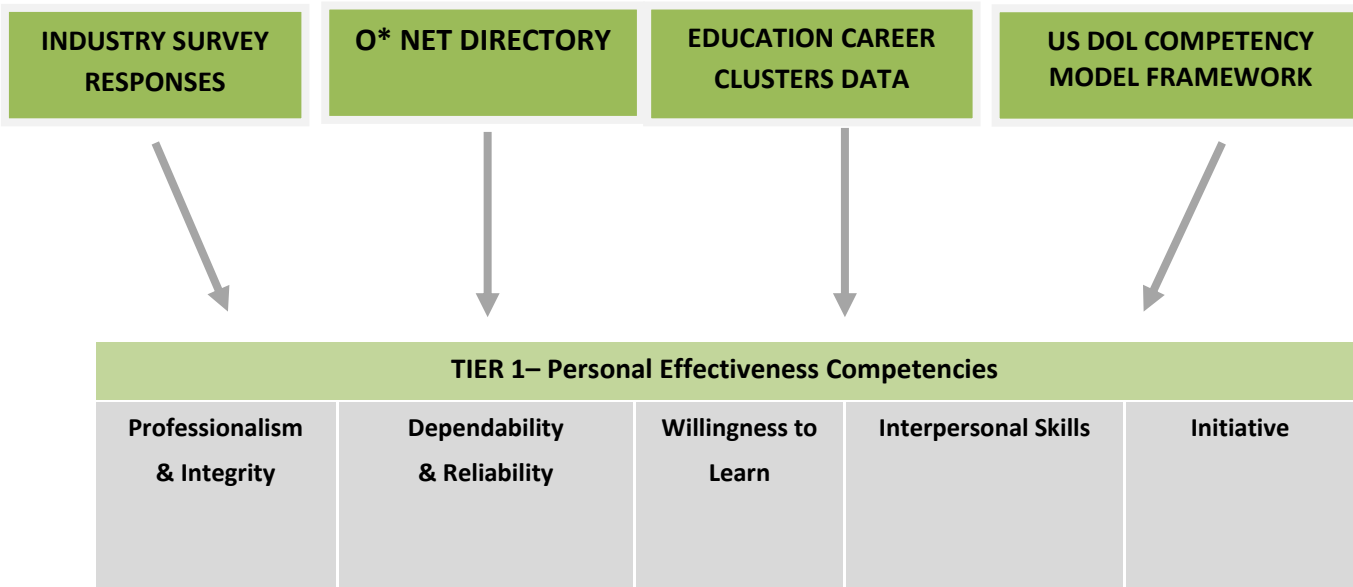


Foundational Competencies

The **Foundational Competencies** block includes Tiers 1 through 3 and the essentials for early success in school and work life are identified. These competencies are integral for all workers to be successful in any organization and across all occupations in all industries. An industry survey with a specific set of questions was designed and administered to IT industry professionals in the region to identify the competencies in this tier. Often business leaders elaborated on certain competencies outside the survey questions, which was also incorporated into the tiers.

**Tier 1: Personal Effectiveness Competencies**

Starting at the bottom of the pyramid this tier is comprised of competencies that are often referred to as “soft skills” and essential in all life roles. Using the US-DOL competency model as a framework, the survey results were mapped against O\*Net(a system that serves as the nation's primary source of occupational information, providing comprehensive information on key attributes and characteristics of workers and occupations) and Education Clusters data to develop this tier.



Each competency is then described in terms of behavioral attributes.



**Professionalism & Integrity**

Attributes
Demonstrates self discipline, self-worth and positive attitude in a work situation
Is free from substance abuse
Maintains a professional appearance
Complies with organizational policies and procedures
Takes responsibility for one's own work assignment

**Dependability & Reliability**

Attributes
Follows policies and procedures, thus exhibiting commitment to the organization
Diligently follows through on commitments and consistently meets deadlines
Demonstrates regular and punctual attendance

**Willingness to Learn**

Attributes
Is flexible and willing to learn new knowledge and skills
Develops a personal career plan to meet career goals and objectives
Demonstrates knowledge of IT as a constantly changing and fast growing field
Takes charge of personal career development by identifying occupations interests, strengths, options and opportunities

**Interpersonal Skills**

Attributes
Maintains open communication with others, recognizes and accurately interprets the verbal and non verbal behavior of others.
Demonstrates culture and diversity awareness
Displays adequate concern for others by being sensitive to their needs and feelings

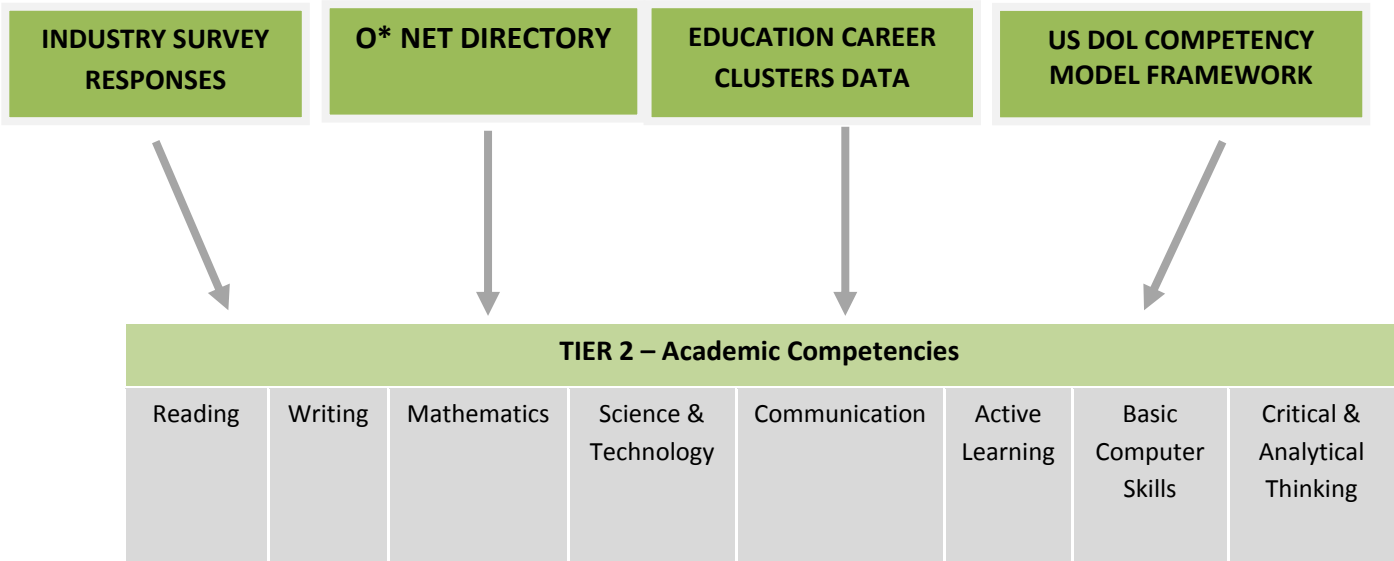
**Initiative**

Attributes
Pursues work with energy, drive and goes beyond routine demands of the job
Strives to exceed standards and expectations
Establishes and maintains personally challenging but realistic work goals
Is able to perform effectively even with minimal direction and support
Self motivated



## Tier 2—Academic Competencies

The second tier in the Foundation competencies block covers basic educational competencies that are learned in an educational setting along with cognitive functions and thinking styles. Typically these competencies form the foundation for the Occupation and Industry specific Competencies. This tier was also developed by mapping the survey results against O\*Net and Education Clusters data.



Foundational Competencies

Each competency is then described in terms of behavioral attributes.

### Reading

Attributes
Comprehends and evaluates oral and written information in documents
Locates written information from various sources to communicate with co-workers and clients or participants
Demonstrates ability to use reading strategies to learn meaning, technical concepts, vocabulary and follow instructions
Identifies main ideas, notes details and facts, detects inconsistencies, identifies implied meaning, missing information and trends

### Writing

Attributes
Demonstrates ability to organize/collect, evaluate and present written information
Uses correct grammar, punctuation and terminology to write and edit documents
Interprets and uses tables, charts, figures to support written and oral communication
Adapts language for audience, purpose, situation





### Mathematics

Attributes
Demonstrates mathematics knowledge and skills required to pursue opportunities within the IT cluster
Applies, translates problems into appropriate math calculations

### Science & Technology

Attributes
Demonstrates Science knowledge and skills required to pursue a career cluster within the IT cluster
Applies basic principles and technology to complete tasks

### Communication

Attributes
Interprets verbal and non verbal behaviors to enhance communication with co-workers and clients / participants
Applies active listening skills to obtain and clarify information
Demonstrates ability to communicate and resolve conflicts with a diverse group
Influences or persuasively presents thoughts and ideas, gains commitment and ensures supports for proposed ideas

### Active Learning

Attributes
Applies a range of learning techniques to acquire new knowledge and skills, processes and retains information; identifies when it is necessary to acquire new knowledge and skills
Integrates new knowledge to complete tasks

### Basic Computer Skills

Attributes
Understands basic computer hardware and software to perform tasks and is familiar with fundamental capabilities of computers
Accesses and evaluate Internet resources
Uses word processing programs to create, edit and retrieve files
Uses electronic mail applications

### Critical and Analytical Thinking

Attributes
Demonstrates sufficient inductive and deductive reasoning ability to perform job
Identifies connections between issues, quickly understands, orients and changes direction when working on multiple projects or issues
Simple solutions to problems, common sense





**Tier 3 —Workplace Competencies**

The competencies in this tier include those skills and abilities that permit an individual to conduct his/her work related activities in an effective and efficient manner. These competencies were derived from the Education Career Cluster Data and the US DOL Competency Model Framework.



TIER 3 – Workplace Competencies						
Teamwork	Adaptability/ Flexibility	Customer Focus	Planning & Organizing	Problem Solving & Decision Making	Business Fundamentals	Working with Tools & Technology

Foundational Competencies

Each competency is then described in terms of behavioral attributes.

**Teamwork**

Attributes
Builds interpersonal skills with individuals and other team members
Understands best practices for successful team functioning
Gives and receives feedback constructively
Leverages the strengths of others to accomplish a common goal

**Adaptability / Flexibility**

Attributes
Is able to adapt and manage change and entertains new ideas
Demonstrates ability to work with people from diverse backgrounds
Performs more than one task at a time while being able to follow each task through to completion





**Customer Focus**

Attributes
Demonstrates knowledge of organization’s offerings and of customers’ importance to the organization
Demonstrates ability to assist customers in a professional manner

**Planning & Organizing**

Attributes
Plans and prioritizes work to manage time effectively and accomplish the assigned tasks
Develops plan, timeline, list of resources required, goals for projects and adheres to them
Finds ways to organize work to accomplish tasks more efficiently

**Problem Solving and Decision Making**

Attributes
Identifies or recognizes the existence of a problem and analyzes the components of it
Generates a variety of solutions to the problem

**Business Fundamentals**

Attributes
Identify industry trends and understand the company’s position in the market as well as in comparison to competition

**Working with Tools and Technology**

Attributes
Knowledge of Microsoft Office Products and skills

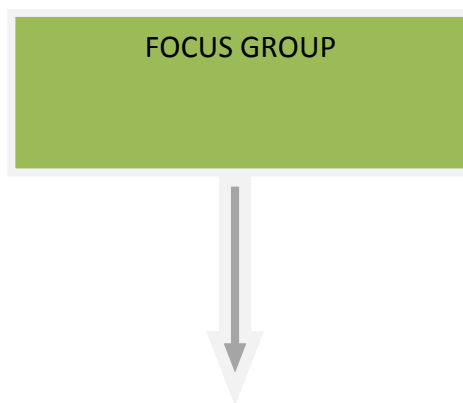




The second block of the pyramid are **Industry Related Competencies** that are common to all jobs within a particular industry i.e. Information Technology in this case. Tiers 4 & 5 reflected the consensus of industry professionals collected from these experts in a tightly-focused work session. The panel consisted of business leaders, managers, and education and training providers.

#### Tier 4 —Industry-Wide Technical Competencies

The first tier in Industry related competencies represents the knowledge, skills and abilities required by all occupations within a specific industry. Each industry has a unique set of technical competencies that have been defined by the respective subject matter experts (SME's). To derive these competencies representatives from Missouri's IT industry met and brainstormed in a focus group setting.



TIER 4 – Industry-Wide Technical Competencies							
Information Technology Foundations	Information Systems Management	Networks & Mobility	Software Development	User & Customer Support	Digital Media Design & Production	Compliance & Regulation	Security & Data Integrity

Each competency is further divided as:

- Critical Work functions – the main areas of work under this competency
- Technical Areas – the technical aspects of this competency

Industry Related Competencies





## Information Technology Foundations

### Critical Work Functions:

- Information Management
- IT Financial Management
- Networking
- Software Development
- Systems Development Life Cycle
- User and Customer Support
- Visual Communications
- Web Systems and Technology

### Technical Areas :

#### Business Process Management

- Business activity management
- Business process management
- Change management
- Content management
- Document management
- Imaging
- Process Improvement and Process modeling
- Systems process integration

#### IT Organizational Structure

- IT integration within a company
- Support for business solutions

#### Platform Technologies

- Architecture and organization
- Computing infrastructures
- Enterprise deployment software
- Firmware
- Hardware
- Open source

#### Systems Administration and Maintenance

- Administrative activities
- Administrative domains
- Applications

#### Systems Integration and Architecture

- Acquisition and sourcing
- Architecture
- Integration and deployment
- Organizational context
- Requirements
- Testing and quality assurance

#### Web Management

- Analytics

- Key performance indicators
- Optimization
- Utilization

## Information Systems Management

### Critical Work Functions:

- Analyze and Design Databases
- Business Intelligence
- Content Management
- Develop and Implement Databases
- Maintain Quality Assurance
- Perform Database Administration and Maintenance
- Perform Database Testing
- Performance Analytics
- Provide Data Assurance

## Networks & Mobility

### Critical Work Functions

- Design Local area, Wide Area and Virtual Networks
- Install and Expand New facilities
- Optimize and Maintain Network Software and Hardware
- Manage, Administer and Secure Local Area Networks
- Perform Network Infrastructure Troubleshooting

### Technical Content Areas:

- Application areas
- Foundations of networking
- LANS, WANS, virtual networks
- Mobile media
- Network management
- Physical layer
- Protocols (e.g. TCP, UDP, VoIP)
- Routing and switching
- Security
- Wireless

## Software Development

### Critical Work Functions:

- Analyze, Design, Develop, Adapt, Test and Maintain computer and Internet-based Applications
- Apply Principles of User-centered Design to Increase the Usability
- Establish and Maintain Consistency of a Product's Performance and its Functional and Physical Attributes with its Requirements, Design, and Operational Information Throughout its Life Cycle

- Implement, Support and Maintain Applications
- Test and Validate Applications

#### **Technical Content Areas:**

##### **Application Architecture**

- Configuration and adaptation
- Deployment
- Global standards
- Patterns
- Risk management
- Scalability
- Standards
- Strategies

##### **Development/Programming Fundamentals**

- Data structures (list, vector, array, stack, queue, tree, graph)
- Algorithms (sorting, searching)
- Basic programming constructs (assignment, arithmetic expressions, loops, conditions, input/output, error handling)
- Event-driven programming
- Object oriented programming
- Programming concurrent processes
- User interface/user experience (UI/UX)

##### **Development/Programming Technologies**

- Data mapping and exchange
- Familiarity with multiple programming languages
- Integrative coding
- Inter-systems communications
- Parallel systems development/programming
- Scripting techniques
- Software security practices

##### **Social Networking Services**

- Business/educational/personal networks
- Internal/external services
- Privacy/security
- Social capital

##### **Web Development**

- Quality assurance
- Technical content
- Web site design
- Web site development/programming and maintenance
- Web site/Internet security

#### **User & Customer Support**

##### **Critical Work Functions:**

- Assess User Needs

- Deploy Hardware/Software
- Monitor Metrics and Performance
- Provide Customer Service and Support
- Provide Training on New Hardware/Software
- Troubleshoot Problems

**Technical Content Areas:**

**Engagement**

- Communicating with the user
- Community architecture
- Content development and categorization
- Engagement success metrics
- Gadgets
- Inventory and audit of content assets

**Helpdesk Functions**

- Administrative activities
- Application support
- Asset management
- Computing infrastructures and networks
- Configuration management
- Incident and problem management
- Operating systems
- Release management
- Systems administration, monitoring, and maintenance
- Strategies for engaging the community
- User participation guidelines/ground rules

**Digital Media**

**Critical Work Functions:**

- Design, Edit and Develop Audio, Video, Graphic and Animations
- Use Specialized Software Applications to Create Digital Media for Kiosks, Computer Applications, Websites, Print Media, Broadcast Media And Entertainment
- Visualize Graphic Representation of Concepts or Data

**Technical Content Areas:**

- Digital media application test and implementation
- Digital media design
- Digital media production and acquisition
- Gaming
- Graphics
- Multi-media technology
- Multi-user applications
- Streaming technologies
- Utilization and optimization



- Videos and dialogues
- Visual and functional design

## Compliance

### Critical Work Functions:

- Conduct Business Within the Standards of Corporate Ethics and Compliance
- Develop Measures to Ensure that Data and Information Systems Comply With Federal, State, Local Laws and Regulations, and Third Party Guidelines
- Develop Measures to Protect Confidential Data
- Follow Governance, Risk Management and Compliance Procedures

### Technical Content Areas:

#### Compliance Standards

- Global and Internet standards

#### Important Topics

- Intellectual property
- Professional ethics
- Safeguarding confidential data

#### Public Policy

- Client program management operations (PMO)
- Code of Federal Regulations (CFR)
- ISO requirements
- State and local laws

## Security & Data Integrity

### Critical Work Functions:

- Assure data and information systems are available to authorized uses and ensures data integrity
- Protect data and information systems from accidental disclosure or destruction
- Protect data and information systems from unauthorized access or modification
- Protect data and information systems vulnerable to inappropriate use or malicious compromise

### Technical Content Areas:

#### Data Accessibility

- Fundamentals of data security
- Operational issues
- Policy development
- User and customer support

#### Data Integrity

- Business continuity
- Disaster recovery
- Encryption
- ID management
- Information states





- Redundancy

**Security Clearance**

- US Citizenship (if required)

**Threats**

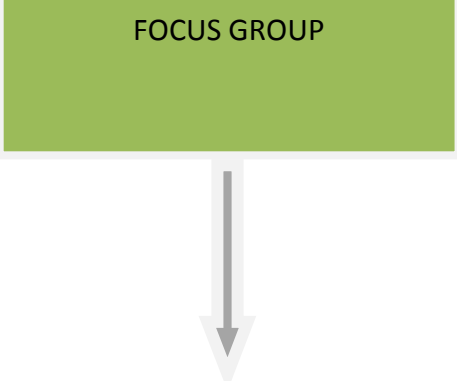
- Attacks
- Forensics
- Security domains
- Security mechanisms
- Security services
- Security tools
- Threat analysis model
- Vulnerabilities





### Tier 5 —Industry-Specific Technical Competencies

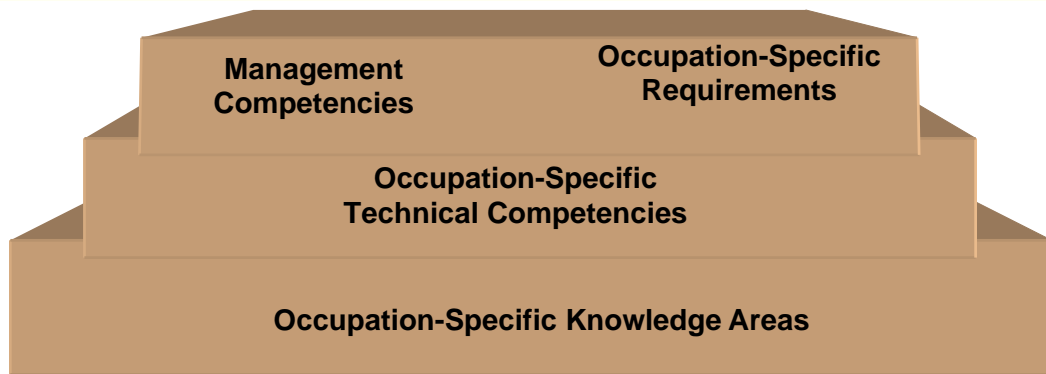
This tier includes competencies that represent knowledge, skills and abilities required for all occupations within a specific industry sector. As mentioned earlier, this report employs IT as an industry horizontal and competencies for IT occupations across certain industries are investigated. Missouri staffing patterns reflected high IT employment in specific sectors such as **Healthcare Services**, **Financial Services** and **Homeland Security**. During the focus group sessions, industry representatives also vetted these as the three major sectors using IT in Missouri. Within each of these sectors, Knowledge Areas (KAs) were identified. These KA's provide a list of competencies that all workers in the specific industry must have to be effective in their occupations.



TIER 5 – Industry-Specific Technical Competencies		
Healthcare Services	Financial Services	Homeland Security
<ul style="list-style-type: none"> <li>Electronic Data Capture</li> <li>Medical Device Management</li> <li>Data Retention, Storage and Archiving</li> <li>Data Privacy and Security</li> <li>Litigation Response</li> <li>CMS – Medicaid / Medicare</li> <li>E-Discovery</li> <li>Clinical Information Systems – HTT, PHR HER</li> <li>Telemedicine</li> <li>Medical Imaging</li> <li>Web Portals</li> </ul>	<ul style="list-style-type: none"> <li>Banking Systems</li> <li>Electronic Funds Transfers</li> <li>Business Intelligence &amp; Reporting</li> <li>Imaging and Document Management</li> <li>Information Security</li> <li>Regulatory Compliances e.g.: SOX, Standard Bodies &amp; Agencies</li> </ul>	<ul style="list-style-type: none"> <li>Communication</li> <li>Surveillance</li> <li>Data warehousing</li> <li>Business Analysis</li> <li>Interagency operability</li> <li>Information Security</li> </ul>

Industry Related Competencies





The last group consists of **Occupation related competencies** and is defined in terms of occupation related knowledge, education, credentials and performance. They are derived from the O\*Net directory. A specific list of IT occupations has been focused on in these tiers. The 12 Targeted IT occupations were identified as follows: a custom industry staffing pattern was identified for the IT industry cluster in Missouri. These were sorted by their impact on the economy and then mapped against the US DOL’s In Demand occupation list for IT. This list was then vetted by the State’s industry specialists and is as described below:

O*NET-SOC Code	Title
11-3021	Computer and Information Systems Managers
15-1021	Computer Programmers
15-1031	Computer Software Engineers, Applications
15-1032	Computer Software Engineers, Systems Software
15-1041	Computer Support Specialists
15-1051	Computer Systems Analysts
15-1061	Database Administrators
15-1071	Network and Computer Systems Administrators
15-1081	Network Systems and Data Communications Analysts
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers
49-9052	Telecommunications Line Installers and Repairers

It is important to note that the occupations in this list are obtained from the state’s list of occupations in the IT cluster and do not include the entire gamut of IT occupations available.





### Tier 6 —Occupation-Specific Knowledge Areas

This tier contains the specific **knowledge areas** that are required for the 12 targeted IT occupations. Each knowledge area covers an area of expertise that the respective occupation requires.

O\* NET DIRECTORY



TIER 6 —Occupation Specific Knowledge Areas for :
Computer and Information Systems Managers
Computer Programmers
Computer Software Engineers, Applications
Computer Software Engineers, Systems Software
Computer Support Specialists
Computer Systems Analysts
Database Administrators
Network and Computer Systems Administrators
Network Systems and Data Communications Analysts
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Telecommunications Equipment Installers and Repairers, Except Line Installers
Telecommunications Line Installers and Repairers





### Computer and Information System Managers

- Computers and Electronics
- Administration and Management
- Customer and Personal Service
- Production and Processing
- English Language
- Personnel and Human Resource
- Telecommunications
- Economics and Accounting

### Computer Programmers

- Computers and Electronics
- English Language
- Mathematics

### Computer Software Engineers, Applications

- Computers and Electronics
- Engineering and Technology
- Mathematics
- Telecommunications
- English Language
- Design

### Computer Software Engineers, Systems Software

- Computers and Electronics
- Mathematics
- English Language
- Engineering and Technology
- Customer and Personal Service
- Design Education and Training
- Communication and Media
- Clerical
- Telecommunications

### Computer Support Specialists

- Computers and Electronics
- Customer and Personal Service
- English Language
- Telecommunications
- Clerical
- Administration and Management
- Engineering and Technology

### Computer Support Analysts

- Computer and Electronics
- English Language
- Customer and Personal Service
- Clerical
- Mathematics
- Education and Training





### Database Administrator

- Computer and Electronics
- English Language
- Customer and Personal Service
- Mathematics
- Clerical

### Network and Computer Systems Administrator

- Computer and Electronics
- English Language
- Mathematics
- Administration and Management

### Network Systems and Data Communication Analysts

- Computers and Electronics
- Customers and Personal Service
- Telecommunications
- Administration and Management
- Education and Training
- English Language
- Engineering and Technology
- Mathematics

### Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products

- Sales and Marketing
- Customers and Personal Service
- English Language
- Computer and Electronics
- Production and Processing

### Telecommunications Equipment Installers and Repairers, Including Line Installers \*

- Telecommunications
- Computers and Electronics
- Customer and Personal Service
- Mechanical
- Public Safety and Security
- English Language
- Education and Training
- Engineering and Technology
- Mathematics
- Administration and Management

\*Telecommunications Equipment Installers and Repairers, Except Line Installers and Telecommunications Line Installers and Repairers share the same **Knowledge Areas** hence they are combined.





### Tier 7 —Occupation-Specific Technical Competencies

All occupations require certain technical competencies to perform the job. This tier contains **technical competencies** that are specific to the 12 targeted IT occupations. Listed below are the ones required for each technical competency.

O\* NET DIRECTORY



TIER 7 –Occupation Specific Technical Competencies for:
Computer and Information Systems Managers
Computer Programmers
Computer Software Engineers, Applications
Computer Software Engineers, Systems Software
Computer Support Specialists
Computer Systems Analysts
Database Administrators
Network and Computer Systems Administrators
Network Systems and Data Communications Analysts
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Telecommunications Equipment Installers and Repairers, Except Line Installers
Telecommunications Line Installers and Repairers

Occupation Related Competencies





### Computer and Information System Managers

Tools used in this occupation	Technology used in this occupation
Access servers Computer Tool kits Network Analyzers Network interface cards Peripheral controller cards	Database management system software – AlphaFour software; Microsoft Access; Microsoft SQL Server; Oracle software  Development environment software – Assembler; Borland Delphi software; C: Microsoft.NET Framework  Enterprise resource planning ERP software – Microsoft Dynamics AX; Microsoft Dynamics NAV; Oracle E-Business Suite; Oracle JD Edwards OneWorld  Object or component oriented development software- Borland Paradox; C++; Practical extraction and reporting language Perl; Sun Microsystems Java  Web platform development software- Adobe Systems Adobe Flex; JavaScript; Microsoft Active Server Pages ASP; Ruby on Rails

### Computer Programmers

Tools used in this occupation	Technology used in this occupation
Computer servers Desktop computers Mainframe computers Serial port cards	Compiler and decompiler software- Code generator software; Command interpreters; Threaded code compiler; Xerces2 Java Parser  Database environment software – Microsoft SQL Server; mSQL software; MySQL software; Pick software  Development environment software – Haskell; kernel; Microsoft Visual Basic; Ruby  Object or component oriented development software- C++; Greatis Object Inspector; Oberon; PowerSoft PowerBuilder  Program testing software- Debugging software; Low-level debugger software; Source code editor software; Symbolic debugger software  Web platform development software- Apache Struts; Hypertext markup language HTML; JavaScript; Microsoft Silverlight

### Computer Software Engineers, Applications

Tools used in this occupation	Technology used in this occupation
Computer servers Flash memory storage devices Integrated circuit testers Notebook computers Personal digital assistant (PDA)s or organizers	Database management system software – Computer Associates integrated data management system CA-IDMS; Data manipulation language DML; Microsoft SQL Server; MySQL software  Development environment software- American National Standards Institute ANSI C; IBM Rational Rose XDE Developer; Microsoft Visual Basic; XML Path Language XPATH  Object or component oriented development software –





	<p>DRAGOON software; Self; Simulation language SIMULA; Smalltalk</p> <p>Program testing software – IBM Rational PurifyPlus; Mercury Interactive LoadRunner; Source code editor software; Usability testing software</p> <p>Web platform development software- Extensible stylesheet language transformations XSLT; Hypertext markup language HTML; Javascript; Microsoft ASP.NET</p>
--	--

**Computer Software Engineers, Systems Software**

Tools used in this occupation	Technology used in this occupation
<p>Central processing unit (CPU) processors</p> <p>Computer servers</p> <p>Desktop computers</p> <p>Integrated circuit testers</p> <p>Personal digital assistant (PDA)s organizers</p>	<p>Database management system software- Microsoft transact-structural query language T-SQL; MySQL software; Oracle procedural language/structured query language PL/SQL; Sybase SQL Server</p> <p>Development environment software- AWK; Flow-Matic; IBM Rational Rose XDE Developer D93; Microsoft Visual Basic</p> <p>Object or component oriented development software- Document Object model DOM Scripting; Emerald; Simpel API or XML SAX; Sun Microsystems Java</p> <p>Operating system software- Linux; UNIS; VxWorks software; Win CE</p> <p>Program testing software- Defect tracking software; Dynamic analysis software; IBM Rational ClearQuest; Mercury Interactive LoadRunner</p>

**Computer Support Specialists**

Tools used in this occupation	Technology used in this occupation
<p>Computer tool kits</p> <p>Hard disk arrays</p> <p>Network analyzers</p> <p>Power meters</p> <p>Reflectometers</p>	<p>Backup or archival software – Backup and archival software; Disaster recovery software; Microsoft Volume Shadow Copy Service Symantec LiveState</p> <p>Configuration management software- Automated installation software; Deployment software ; Patch management software</p> <p>Desktop communication software- CrossTec NetOp Remote Control; Remote control software; Stac Software ReachOut; Symantec pcAnywhere</p> <p>Internet directory services software- Active directory software; Domain name systems DNS software; Network directory services software</p> <p>Operating system software- Event log monitor software Microsoft Windows Pre-installation Environment; Operating system monitoring software; Personal computer diagnostics software</p>





### Computer System Analysts

Tools used in this occupation	Technology used in this occupation
Desktop computers Mainframe computers Notebook computers Personal digital assistant (PDA)s or organizers	Configuration management software-HyperSpace software; IBM Rational ClearCase; Wise Solutions software; Wise Solutions Wise for Windows Installer  Database management system software- Microsoft SQL Server; MySQL software Oracle procedural language/structured query language PL/SQL; Sybase SQL Server  Development environment software- C; IBM Rational Rose XDE Developer; Microsoft Visual Basic; Symantec Visual Cafe  Object or component oriented development software- C++; Distributed component object model DCOM software; Rapide; Sun Microsystems Java  Program testing software- Compatibility testing software; IBM Rational PurifyPlus; Mercury Interactive LoadRunner; Usability testing software  Web platform development software- Allaire ColdFusion; Cascading Style Sheets CSS; JavaScript; Microsoft Active Server Pages ASP

### Database Administrator

Tools used in this occupation	Technology used in this occupation
Desktop computers Hard disk arrays – Redundant array of independent disk RAID systems Hard disk drives Notebook computers Tape arrays – Tape libraries	Backup or archival software – Acronis Recovery Expert; BMC Catalog Manager; Oracle Data Guard; VERITAS NetBackup  Database management system software – Microsoft SQL Server; MySQL software; Quest Central; Sybase Replication Server  Development environment software – C; Microsoft Visual Basic; Prolong; Restructured extended executed or REXX  Metadata management software – AllFusion Erwin Data Modeler; Data modeling software; IBM Rational Data Architect; Visual; Paradigm DB Visual ARCHITECT  Object or component oriented development software – Microsoft Visual Basic.NET; Practical extraction and reporting language Perl; Sun Microsystems Java; Sybase PowerBuilder





## Network and Computer Systems Administrator

Tools used in this occupation	Technology used in this occupation
<p>Computer tool kits</p> <p>Interferometers- Optical spectrum analyzers</p> <p>Network analyzers – Asynchronous transfer mode ATM analyzers; Bit error rate BER tester; Synchronous optical network SONET analyzers; T-Birds</p> <p>Power meters – Powerline monitors</p> <p>Protocol analyzers</p>	<p>Administration software – Cisco Systems CiscoWorks; Hewlett-Packard HP Network Node Manager; Network shutdown software, SolarWinds software</p> <p>Configuration management software – Application management software; Automated installation software ; Microsoft Windows Sysprep; Systems and applications migration software</p> <p>Network monitoring software – Dartware, InterMapper; Ethereal; Veritas NerveCenter; ZABBIX software</p> <p>Network security or virtual private network VPN management software – Citriz MetaFrame; intrusion prevention system IPS software; OpenService Open Nerve Center; Security incident handling software</p> <p>Transaction security and virus protection software – Encryption software; Honeypot; Packet filter software; Ping software</p>

## Network Systems and Data Communication Analysts

Tools used in this occupation	Technology used in this occupation
<p>Integrated services digital network ISDN testers – integrated service digital network ISDN analyzers</p> <p>Mutimeters – Network multimeters</p> <p>Network analyzers – Asynchronous transfer mode ATM analyzers; Bit error rate BER testers; Network connectivity testers; Wider area network WAN analyzers</p> <p>Power meters – Fiber optic power meters</p> <p>Protocol analyzers</p>	<p>Administration software - Citrix MetaFrame; Lucent VitalSuite; NetIQ software; SolarWinds software</p> <p>Configuration management software – Application management software; Automated installation software; patch and upgrade management software; Software distribution software</p> <p>Network monitoring software – Discrete event simulation software; Ethereal; Ipswitch WhatsUp Gold; Symantec Intruder Alert</p> <p>Network security or virtual private VPN management software – Intrusion prevention system IPS software; Network and system vulnerability assessment software; Risk assessment software; Virtual local area network management software</p> <p>Transaction security and virus protection software- CA eTrust; Encryption software; McAfee VirusScan; Penetration testing software</p>





### Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products

Tools used in this occupation	Technology used in this occupation
Notebook computers – Laptop computers Personal computers Personal digital assistant(PDA)s or organizers Tablet computer	Customer relationship management CRM software- FrontRange Solutions Goldmine software; NetSuite NetCRM; Sybase iAnywhere Pharma Anywhere; Sybase iAnywhere Sales Anywhere  Database user interface and query software- Data entry software; Microsoft Access  Electronic mail software – IBM Lotus Notes; Microsoft Exchange; Microsoft Outlook  Presentation software- Microsoft Powerpoint  Project Management software- Kameleon Software E-Business Suite Special Edition  Spreadsheet software – Microsoft Excel

### Telecommunications Equipment Installers and Repairers, Except Line Installers

Tools used in this occupation	Technology used in this occupation
Test meters, circuit diagrams, polarity probes Crew Trucks	Switching system components and associated testing equipment  Computer printouts, circuit layouts, work orders and diagrams

### Telecommunications Line Installers and Repairers

Tools used in this occupation	Technology used in this occupation
Splice cables, hand tools, epoxy and mechanical equipment Terminal boxes, auxiliary equipment and appliances, bucket trucks, poles and ladders	Amplifiers and repeaters

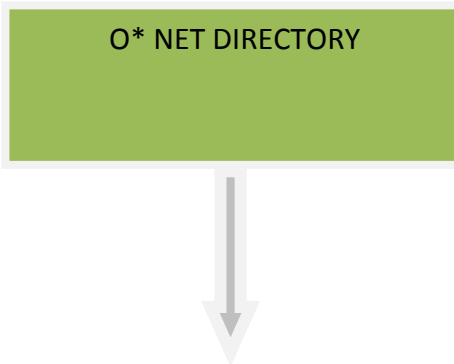
Occupation Related Competencies





### Tier 8 – Occupation Specific Requirements

This tier includes **occupation specific job credentials** such as educational degrees, certifications, licensures, physical training requirements specific to a particular occupation within an industry. The US Department of Education provides a taxonomic scheme of programs of study and descriptions called Classification of Instructional Programs (CIP). The National Crosswalk Service Center linked this data with the list of occupations in the O\*NET Directory and created a comprehensive list of instructional programs for each occupation in each industry.



<b>TIER 8 –Occupation Specific Requirements for:</b>
Computer and Information Systems Managers
Computer Programmers
Computer Software Engineers, Applications
Computer Software Engineers, Systems Software
Computer Support Specialists
Computer Systems Analysts
Database Administrators
Network and Computer Systems Administrators
Network Systems and Data Communications Analysts
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
Telecommunications Equipment Installers and Repairers, Except Line Installers
Telecommunications Line Installers and Repairers

Occupation Related Competencies





### Computer and Information Systems Managers

CIP Code	CIP Title
11.0101	Computer and Information Sciences, General
11.0401	Information Science/Studies
11.0701	Computer Science
11.1001	System Administration/Administrator
52.0205	Operations Management and Supervision
52.1201	Management Information Systems, General
52.1206	Information Resources Management/CIO Training
52.1207	Knowledge Management

### Computer Programmers

CIP Code	CIP Title
11.0102	Artificial Intelligence and Robotics
11.0201	Computer Programming/Programmer, General
11.0202	Computer Programming, Specific Applications
11.0203	Computer Programming, Vendor/Product Certification
11.0801	Web Page, Digital/Multimedia & Information Resources Design
11.0803	Computer Graphics
11.1004	Web/Multimedia Management and Webmaster
26.1103	Bioinformatics
51.0709	Medical Office Computer Specialist/Assistant
51.2706	Medical Informatics
52.0208	E-Commerce/Electronic Commerce
52.1201	Management Information Systems, General





### Computer Software Engineers, Applications

CIP Code	CIP Title
11.0102	Artificial Intelligence and Robotics
11.0103	Information Technology
11.0701	Computer Science
14.0901	Computer Engineering, General
14.0903	Computer Software Engineering
15.1299	Computer Engineering Technologies/Technicians, Other
26.1103	Bioinformatics
51.2706	Medical Informatics
51.2799	Medical Illustration and Informatics, Other

### Computer Software Engineers, Systems Software

CIP Code	CIP Title
11.0102	Artificial Intelligence and Robotics
11.0103	Information Technology
11.0401	Information Science/Studies
11.0701	Computer Science
11.1002	System, Networking, and LAN/WAN Management/Manager
14.0901	Computer Engineering, General
15.1299	Computer Engineering Technologies/Technicians, Other





### Computer Support Specialists

CIP Code	CIP Title
01.0106	Agricultural Business Technology
11.0301	Data Processing and Data Processing Technology/Technician
15.1203	Computer Hardware Technology/Technician
15.1204	Computer Software Technology/Technician
30.1601	Accounting and Computer Science
51.0709	Medical Office Computer Specialist/Assistant

### Computer Systems Analysts

CIP Code	CIP Title
11.0101	Computer and Information Sciences, General
11.0103	Information Technology
11.0501	Computer Systems Analysis/Analyst
11.1004	Web/Multimedia Management and Webmaster

### Database Administrators

CIP Code	CIP Title
11.0101	Computer and Information Sciences, General
11.0501	Computer Systems Analysis/Analyst
11.0802	Data Modeling/Warehousing and Database Administration
11.1003	Computer and Information Systems Security
52.1201	Management Information Systems, General





### Network and Computer Systems Administrators

CIP Code	CIP Title
11.0101	Computer and Information Sciences, General
11.0401	Information Science/Studies
11.0501	Computer Systems Analysis/Analyst
11.0901	Computer Systems Networking and Telecommunications
11.1001	System Administration/Administrator
11.1002	System, Networking, and LAN/WAN Management/Manager
11.1003	Computer and Information Systems Security
11.9999	Computer and Information Sciences & Support Services, Other

### Network Systems and Data Communications Analysts

CIP Code	CIP Title
11.0101	Computer and Information Sciences, General
11.0103	Information Technology
11.0501	Computer Systems Analysis/Analyst
11.0901	Computer Systems Networking and Telecommunications
11.1002	System, Networking, and LAN/WAN Management/Manager
11.1003	Computer and Information Systems Security

### Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products

CIP Code	CIP Title
52.1804	Selling Skills and Sales Operations
52.9999	Business, Management, Marketing, & Related Support Services, Other





### Telecommunications Equipment Installers and Repairers, including Line Installers \*

CIP Code	CIP Title
47.0103	Communications Systems Installation and Repair Technology

\*Telecommunications Equipment Installers and Repairers, Except Line Installers and Telecommunications Line Installers and Repairers are required to have the same minimum level of **occupational specific job credentials**.

#### Tier 9 – Management Competencies

This tier includes competencies that are specific to supervisory and managerial occupations within this industry. These competencies are:

- Manpower Planning
- Delegating
- Managing Work Flow
- Entrepreneurship
- Leadership
- Developing & Monitoring
- Preparing and Managing Budgets
- Team Building
- Developing an Organizational Vision
- Managing Resources

