

TABLE 98

Impact of cloud-based computing systems and applications technology on skill level of workforce, by industry: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	Number of workers			Skill level of workers			STEM skills of workers			
			Increased	Decreased	Did not change	Increased	Decreased	Did not change	Increased	Decreased	Did not change	Did not employ
All industries	11, 21–23, 31–33, 42–81	1,549,065	12.6	3.7	83.7	28.2	0.8	71.0	15.8	0.5	42.3	41.4
Manufacturing industries	31–33	62,089	13.8	4.4	81.8	27.1	1.2	71.7	18.6	0.6	51.0	29.8
Food	311	4,433	16.1	3.2	80.7	23.6	1.0	r 75.4	14.6	0.5	r 40.5	44.3
Beverage and tobacco products	312	3,754	19.0	1.5	79.5	34.0	0.3	r 65.7	19.2	D	43.9	36.1
Textile, apparel, and leather products	313–16	2,586	7.8	8.4	83.8	27.5	3.1	r 69.4	15.8	D	36.5	47.4
Wood products	321	2,002	11.4	8.0	80.6	23.0	D	76.7	12.5	0.0	52.5	35.0
Paper	322	785	16.1	r 2.3	81.6	24.1	D	73.1	17.1	r D	45.4	35.0
Printing and related support activities	323	8,725	9.0	5.9	85.1	25.4	1.7	72.9	12.2	0.6	41.9	45.3
Petroleum and coal products	324	235	4.3	D	94.9	13.3	r 0.0	86.7	11.5	r 0.0	86.4	D
Chemicals	325	2,484	17.7	1.7	80.6	34.4	0.4	r 65.2	26.9	0.0	56.9	16.2
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	194	24.6	r 0.0	75.4	17.9	r 0.0	82.1	11.1	r 0.0	69.1	19.8
Pharmaceuticals and medicines	3254	520	20.0	2.3	77.7	38.5	D	60.8	32.8	0.0	54.6	12.6
Soap, cleaning compound, and toilet preparation manufacturing	3256	560	7.0	D	92.0	30.6	0.0	69.4	24.0	0.0	49.1	26.9
Other chemicals	other 325	1,211	20.3	2.0	77.7	37.0	D	62.6	28.2	0.0	59.5	12.3
Plastics and rubber products	326	2,722	13.8	3.9	82.3	22.6	2.3	r 75.1	18.5	D	55.2	24.4
Nonmetallic mineral products	327	1,720	18.4	4.4	77.2	22.5	D	77.4	14.0	D	53.0	33.0
Primary metals	331	826	19.3	r 5.3	75.4	16.8	D	81.6	11.3	1.8	r 73.6	13.4
Fabricated metal products	332	10,845	15.0	3.7	81.3	26.3	0.9	72.8	19.5	0.5	r 56.2	23.8
Machinery	333	5,611	12.9	2.1	r 85.0	31.6	1.1	r 67.3	27.7	D	57.0	15.2
Computer and electronic products	334	3,186	11.4	4.6	84.0	29.5	1.1	r 69.4	24.9	0.4	r 62.3	12.4
Communications equipment	3342	332	16.3	2.7	81.0	29.9	0.0	70.1	26.7	0.0	59.4	13.9
Semiconductor and other electronic components	3344	1,019	7.9	3.5	r 88.6	23.3	2.5	r 74.1	16.4	D	75.5	7.6
Navigational, measuring, electromedical, and control instruments	3345	1,270	12.4	4.6	83.0	33.2	0.6	r 66.2	30.2	0.6	r 53.7	15.5
Other computer and electronic products	other 334	566	12.5	7.4	r 80.2	31.8	D	67.7	26.9	0.0	59.5	13.6
Electrical equipment, appliances, and components	335	1,287	20.8	4.4	74.8	30.0	2.7	r 67.3	23.8	2.5	r 58.4	15.3
Transportation equipment	336	1,908	17.0	5.4	77.6	27.8	0.7	r 71.5	23.5	D	53.8	22.4
Automobiles, bodies, trailers, and parts	3361–63	1,250	14.4	5.5	80.1	22.0	1.1	r 76.9	22.1	D	52.4	25.2
Aerospace products and parts	3364	336	21.6	2.7	r 75.7	36.5	0.0	63.5	29.0	0.0	58.3	12.7
Other transportation	other 336	322	23.0	r 7.8	r 69.2	40.8	0.0	59.2	23.2	0.0	54.8	21.9
Furniture and related products	337	2,612	12.4	7.6	80.0	25.7	1.6	r 72.7	18.9	0.5	r 52.4	28.2

TABLE 98

Impact of cloud-based computing systems and applications technology on skill level of workforce, by industry: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	Number of workers			Skill level of workers			STEM skills of workers					
			Increased	Decreased	Did not change	Increased	Decreased	Did not change	Increased	Decreased	Did not change	Did not employ		
Miscellaneous	339	6,366	14.3	4.9	80.8	26.9	1.1	r	72.0	17.2	0.3	r	49.5	33.1
Medical equipment and supplies	3391	2,037	15.7	2.9	81.4	36.1		D	63.8	21.6		D	59.3	19.0
Other miscellaneous manufacturing	3399	4,328	13.6	5.8	80.6	22.6	1.6	r	75.8	15.2	0.4	r	44.8	39.7
Nonmanufacturing industries	11, 21–23, 42–81	1,486,975	12.5	3.7	83.8	28.3	0.8		70.9	15.7	0.5		41.9	41.9
Agriculture, forestry, fishing, and hunting	11	3,162	9.4	4.2	r 86.4	23.1		D	75.1	10.8		D	38.5	49.0
Mining, extraction, and support activities	21	2,902	8.6	5.7	r 85.7	21.8		D	76.3	16.1		D	60.9	21.1
Utilities	22	863	8.1	3.4	88.5	25.5	0.9		73.6	12.6	0.7		62.5	24.2
Construction	23	138,956	15.2	3.8	81.0	27.0	1.1		71.9	15.3	0.6		45.1	38.9
Wholesale trade	42	77,394	14.6	3.8	81.6	28.5	0.6		70.9	16.0	0.3		45.1	38.6
Retail trade	44–45	131,408	11.8	4.5	83.7	25.6	1.3		73.1	13.7	0.7		39.5	46.1
Transportation and warehousing	48–49	35,253	14.3	4.2	81.5	25.5	0.6		73.9	12.2	0.2	r	39.4	48.2
Information	51	35,649	13.5	5.4	81.1	33.5	0.5		66.0	24.0	0.4		43.5	32.2
Publishing	511	10,769	17.2	7.2	75.6	33.2	0.9	r	65.9	26.0	0.7	r	46.3	27.0
Newspaper, periodical, book, and directory publishers	5111	5,125	5.9	10.6	83.5	23.3	1.8	r	74.9	12.4	1.2	r	42.1	44.3
Software publishers	5112	5,641	27.5	4.1	68.4	42.3		D	57.6	38.4	0.3	r	50.0	11.3
Telecommunications	517	3,512	11.5	6.8	81.7	40.8	0.7	r	58.5	24.2	1.1	r	45.7	29.0
Data processing, hosting, and related services	518	6,317	22.1	5.0	72.9	43.3	0.4	r	56.3	34.7		D	46.8	18.5
Other information	other 51	15,053	7.7	4.0	88.3	27.8	0.1		72.1	18.0	0.1		39.6	42.3
Finance and insurance	52	97,142	11.4	3.2	85.4	33.5	0.7		65.8	16.3	0.4		42.9	40.4
Real estate and rental and leasing	53	96,310	9.2	3.3	87.5	26.3	0.6		73.1	12.0	0.2		36.3	51.5
Lessors of nonfinancial intangible assets (except copyrighted works)	533	807	12.0	r 17.5	r 70.5	22.7	r 0.0		77.3	12.3	r 0.0		21.4	66.3
Other real estate and rental and leasing	other 53	95,502	9.2	3.2	87.6	26.3	0.6		73.1	12.0	0.2		36.4	51.4
Professional, scientific, and technical services	54	363,059	10.9	2.8	86.3	29.3	0.3		70.4	19.9	0.2		43.8	36.1
Legal services	5411	79,712	8.5	2.9	88.6	20.7	0.2	r	79.1	8.3	0.1	r	32.4	59.2
Accounting, tax preparation, bookkeeping, and payroll services	5412	57,578	10.5	2.7	86.8	27.1	0.6		72.3	18.1	0.4		48.7	32.9
Architectural, engineering, and related services	5413	40,928	13.0	1.9	85.1	28.1	0.1		71.8	25.4	0.1		61.1	13.4
Specialized design services	5414	13,714	7.9	3.9	88.2	25.4		D	74.5	12.1	0.0		33.2	54.7
Computer systems design and related services	5415	63,324	13.7	2.7	83.6	43.5	0.3		56.2	36.0	0.3		46.5	17.3
Management, scientific, and technical consulting services	5416	64,022	10.3	3.0	86.7	30.6	0.4		69.0	20.8	0.3		40.8	38.2
Scientific research and development services	5417	4,188	15.9	2.7	81.4	31.6	0.4		68.0	32.6	0.5	r	55.3	11.6
Advertising, public relations, and related services	5418	15,388	11.4	4.3	84.3	28.9	0.5		70.6	14.7	0.3		37.4	47.6
Other professional, scientific, and technical services	5419	24,167	11.1	3.0	85.9	25.6		D	74.3	14.3		D	49.3	36.4

TABLE 98

Impact of cloud-based computing systems and applications technology on skill level of workforce, by industry: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	Number of workers			Skill level of workers			STEM skills of workers				
			Increased	Decreased	Did not change	Increased	Decreased	Did not change	Increased	Decreased	Did not change	Did not employ	
Management of companies and enterprises	55	806	19.9	D	79.8	42.5	0.0	57.5	14.1	r	0.0	61.7	24.2
Administrative and support and waste management and remediation services	56	85,414	15.7	3.9	80.4	28.5	0.7	70.8	13.9		0.3	38.0	47.8
Educational services	61	23,127	16.4	5.4	78.2	33.9	0.7	65.4	14.8		D	35.4	49.4
Health care and social assistance	62	202,410	13.0	3.4	83.6	29.3	0.6	70.1	15.7		0.4	46.0	37.9
Health care services	621–23	184,835	12.4	3.5	84.1	29.2	0.6	70.2	16.1		0.5	47.2	36.2
Social assistance	624	17,574	19.5	3.0	77.5	30.2	0.5	r 69.3	10.9		D	32.7	56.3
Arts, entertainment, and recreation	71	28,512	8.9	1.6	89.5	22.2	0.3	r 77.5	8.8		D	36.7	54.3
Accommodation and food services	72	94,504	12.7	5.4	81.9	22.1	2.8	75.1	9.2		1.6	35.2	54.0
Other services	81	70,105	13.7	4.2	82.1	31.2	0.8	68.0	14.2		0.2	r 39.4	46.2

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error > 50%.

NAICS = 2017 North American Industry Classification System; STEM = science, technology, engineering, and mathematics.

Note(s):

Detail may not add to total because of rounding or unavailable NAICS detail for select records beyond the 4-digit industry classification. Industry classification is based on dominant establishment payroll. Statistics are representative of companies located in the United States.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, 2019 Annual Business Survey: Data Year 2018.