

TABLE 99

Impact of cloud-based computing systems and applications technology on worker types, by industry: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	Production workers				Nonproduction workers				Supervisory workers				Nonsupervisory workers			
			Increased	Decreased	Did not change	Did not employ	Increased	Decreased	Did not change	Did not employ	Increased	Decreased	Did not change	Did not employ	Increased	Decreased	Did not change	Did not employ
All industries	11, 21–23, 31–33, 42–81	1,549,065	5.9	1.4	51.3	41.4	5.6	1.8	65.2	27.4	5.3	1.2	66.8	26.7	6.6	1.7	67.8	23.9
Manufacturing industries	31–33	62,089	10.2	3.0	75.5	11.3	9.8	2.8	77.3	10.1	7.0	1.8	79.7	11.5	8.5	2.3	79.0	10.2
Food	311	4,433	12.4	3.3	r 71.1	13.2	8.5	4.4	76.0	11.1	6.9	2.1	77.4	13.6	8.6	4.3	76.5	10.6
Beverage and tobacco products	312	3,754	11.1	0.9	75.2	12.8	12.4	1.0	78.3	8.3	11.3	1.0	76.8	10.9	12.8	0.9	78.4	7.9
Textile, apparel, and leather products	313–16	2,586	4.6	5.3	69.1	21.0	6.8	3.9	73.8	15.5	3.1	5.2	73.1	18.6	5.4	3.2	74.2	17.2
Wood products	321	2,002	9.9	5.1	r 75.9	9.1	9.6	3.5	r 79.7	7.2	4.7	0.4	r 84.5	10.4	8.9	3.5	r 81.0	6.6
Paper	322	785	13.0	r 0.6	78.0	8.4	r 22.3	r 2.4	r 72.6	2.7	12.4	r 0.5	r 84.4	2.7	r 12.9	r 1.0	r 83.1	2.9
Printing and related support activities	323	8,725	8.9	4.1	75.9	11.1	6.5	2.8	76.1	14.6	4.6	2.2	75.0	18.2	6.2	2.8	75.1	15.9
Petroleum and coal products	324	235	11.9	r 0.0	86.4	D	4.7	D	89.8	D	1.7	0.0	93.2	D	8.9	r D	85.5	D
Chemicals	325	2,484	13.2	1.2	76.1	9.5	15.9	1.2	76.3	6.6	r 10.0	0.6	r 81.7	7.7	13.5	1.2	77.4	7.9
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	194	27.3	r D	62.4	10.3	r D	D	89.2	7.7	r 4.1	r 0.0	86.7	9.2	r D	D	68.0	D
Pharmaceuticals and medicines	3254	520	12.9	1.9	r 76.2	9.0	r 14.8	1.3	79.3	4.6	r 9.8	1.0	82.7	6.5	r 15.6	1.7	76.9	5.8
Soap, cleaning compound, and toilet preparation manufacturing	3256	560	6.6	D	76.8	15.5	r 9.3	D	76.1	14.3	r 5.5	D	77.5	16.3	r 5.7	D	77.0	15.9
Other chemicals	other 325	1,211	14.0	1.1	78.0	6.9	22.0	1.4	72.9	3.7	r 13.0	0.5	82.4	4.1	r 14.4	1.1	79.1	5.4
Plastics and rubber products	326	2,722	11.7	2.9	80.3	5.1	14.1	2.1	80.8	3.0	13.1	1.5	81.5	3.9	12.9	1.5	82.2	3.4
Nonmetallic mineral products	327	1,720	11.0	2.7	r 74.3	12.0	9.5	2.0	r 75.5	13.0	9.2	1.1	r 79.8	9.9	10.4	1.7	r 76.8	11.1
Primary metals	331	826	17.4	r 0.7	r 75.7	6.2	4.7	1.7	88.8	4.8	r 2.4	r 2.7	r 89.0	5.9	9.1	r 2.3	82.8	5.8

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Fabricated metal products	332	10,845	11.7	2.1	77.5	8.7	10.3	2.9	78.2	8.6	7.5	1.0	r	82.7	8.8	8.9	1.9	80.6	8.6								
Machinery	333	5,611	8.0	1.9	r	76.8	13.3	13.0	1.0	75.7	10.3	6.0	1.6	r	83.8	8.6	8.9	1.5	r	79.9	9.7						
Computer and electronic products	334	3,186	6.7	3.1	75.8	14.4	8.1	3.7	80.1	8.1	6.0	2.4	79.5	12.1	5.4	4.3	81.4	8.9									
Communications equipment	3342	332	9.7	r	2.1	r	74.4	13.8	r	11.7	0.0	84.1	4.2	r	5.7	D	85.5	5.7	r	13.6	D	79.8	5.1	r			
Semiconductor and other electronic components	3344	1,019	5.2	3.1	r	78.9	12.8	7.5	4.0	r	83.3	5.2	5.6	2.0	82.4	10.0	2.1	6.1	r	83.8	8.0						
Navigational, measuring, electromedical, and control instruments	3345	1,270	6.6	3.5	75.6	14.3	8.3	4.6	79.8	7.3	7.9	3.5	r	75.7	12.9	6.1	4.3	82.2	7.3								
Other computer and electronic products	other 334	566	7.6	2.3	r	72.0	18.1	6.5	3.4	r	73.4	16.8	3.2	0.9	78.8	17.1	4.2	r	3.5	r	76.9	15.4					
Electrical equipment, appliances, and components	335	1,287	12.9	3.8	74.2	9.2	12.4	3.3	r	81.7	2.6	12.9	2.7	78.1	6.3	10.2	2.8	82.4	4.6								
Transportation equipment	336	1,908	12.6	2.9	75.1	9.4	8.2	4.8	78.0	9.0	r	8.3	2.4	r	79.0	10.3	9.2	2.0	79.5	9.3							
Automobiles, bodies, trailers, and parts	3361–63	1,250	8.8	3.0	78.2	10.1	r	6.8	5.4	r	77.2	10.6	r	6.9	3.6	r	78.9	10.6	r	7.0	2.8	79.6	10.6	r			
Aerospace products and parts	3364	336	19.9	D	69.3	9.8	14.0	D	79.2	6.3	r	13.3	0.0	76.0	10.6	r	14.9	D	78.3	5.1	r						
Other transportation	other 336	322	20.3	r	4.3	r	68.9	6.5	8.4	r	7.5	r	78.9	5.3	r	9.0	r	D	81.7	8.7	r	11.6	r	0.0	80.2	8.2	r
Furniture and related products	337	2,612	6.9	3.8	r	76.4	12.9	8.6	3.9	r	76.3	11.2	4.4	3.9	r	77.6	14.1	5.3	2.6	r	82.9	9.2					
Miscellaneous	339	6,366	10.1	3.8	74.5	11.6	7.9	3.5	75.2	13.4	5.6	1.6	79.7	13.1	6.7	2.0	78.7	12.6									
Medical equipment and supplies	3391	2,037	15.7	1.2	r	73.3	9.8	6.0	1.6	r	79.3	13.1	7.9	0.9	r	80.8	10.4	7.3	1.6	r	78.4	12.7					
Other miscellaneous manufacturing	3399	4,328	7.5	5.0	75.0	12.5	8.8	4.4	73.3	13.5	4.5	1.8	79.4	14.3	6.4	2.1	79.0	12.5									

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Nonmanufacturing industries	11, 21–23, 42–81	1,486,975	5.7	1.3	50.4	42.6	5.4	1.8	64.7	28.1	5.2	1.2	66.3	27.3	6.5	1.7	67.3	24.5					
Agriculture, forestry, fishing, and hunting	11	3,162	D	D	69.2	25.8	3.0	r	D	68.2	27.0	4.4	D	66.4	26.1	3.2	r	D	72.8	22.2			
Mining, extraction, and support activities	21	2,902	1.9	r	3.3	r	72.5	22.3	2.0	4.9	81.6	11.5	3.8	r	2.3	r	83.2	10.7	2.8	3.2	r	85.6	8.4
Utilities	22	863	4.1	r	0.9	65.9	29.1	5.3	r	1.9	73.6	19.2	3.7	1.3	81.2	13.8	5.8	r	1.4	80.9	11.9		
Construction	23	138,956	8.4	1.2	59.4	31.0	6.9	1.9	67.4	23.8	8.5	1.1	70.9	19.5	8.0	1.5	72.3	18.2					
Wholesale trade	42	77,394	7.2	1.5	54.4	36.9	8.8	2.4	71.2	17.6	6.7	1.2	71.9	20.2	8.6	2.0	70.8	18.6					
Retail trade	44–45	131,408	5.3	1.8	52.7	40.2	5.8	2.4	67.8	24.0	5.2	1.7	69.6	23.5	6.8	1.8	70.0	21.4					
Transportation and warehousing	48–49	35,253	5.7	1.0	47.7	45.6	5.3	2.2	63.1	29.4	7.0	1.3	66.0	25.7	7.5	1.8	66.6	24.1					
Information	51	35,649	7.2	2.5	54.2	36.1	6.7	3.2	66.7	23.4	6.7	2.1	66.8	24.4	7.9	3.1	67.3	21.7					
Publishing	511	10,769	7.4	3.4	58.4	30.8	8.5	4.0	70.5	17.0	9.1	3.3	69.7	17.9	10.3	4.7	70.2	14.8					
Newspaper, periodical, book, and directory publishers	5111	5,125	2.6	5.5	60.7	31.2	2.9	4.5	72.5	20.1	2.4	5.3	69.8	22.5	5.4	5.4	69.6	19.6					
Software publishers	5112	5,641	11.7	1.4	56.5	30.4	13.6	3.6	68.6	14.2	15.2	1.6	r	69.4	13.8	14.9	4.0	70.6	10.5				
Telecommunications	517	3,512	8.7	4.2	53.2	33.9	5.5	5.6	69.2	19.7	3.9	3.1	72.6	20.4	6.5	4.8	72.2	16.5					
Data processing, hosting, and related services	518	6,317	11.3	2.0	52.6	34.1	12.0	2.7	68.3	17.0	9.6	1.5	r	71.9	17.0	13.6	2.7	68.6	15.1				
Other information	other 51	15,053	4.9	1.8	52.1	41.2	3.4	2.2	63.0	31.4	4.4	1.2	61.4	33.0	4.2	1.6	63.5	30.7					
Finance and insurance	52	97,142	5.3	1.5	49.4	43.9	5.1	1.7	66.7	26.5	3.4	1.1	66.5	29.0	5.7	1.7	68.3	24.3					
Real estate and rental and leasing	53	96,310	3.9	1.1	41.6	53.4	4.4	1.7	55.8	38.1	3.8	0.8	57.5	37.9	4.2	1.6	57.8	36.4					
Lessors of nonfinancial intangible assets (except copyrighted works)	533	807	0.0	0.0	40.3	59.7	12.1	r	D	40.4	40.3	D	D	71.6	21.1	12.0	r	D	59.9	21.1			

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Other real estate and rental and leasing	other 53	95,502	3.9	1.1	41.6	53.4	4.3	1.7	56.0	38.0	3.8	0.8	57.3	38.1	4.2	1.6	57.6	36.6
Professional, scientific, and technical services	54	363,059	4.9	0.9	46.6	47.6	4.7	1.3	63.0	31.0	3.9	0.7	62.1	33.3	5.8	1.3	64.0	28.9
Legal services	5411	79,712	3.5	0.9	36.1	59.5	3.4	1.0	59.6	36.0	2.3	0.4	56.8	40.5	4.6	1.3	63.1	31.0
Accounting, tax preparation, bookkeeping, and payroll services	5412	57,578	3.8	0.6	44.5	51.1	4.5	1.5	63.9	30.1	3.1	0.5	62.5	33.9	5.4	1.5	66.6	26.5
Architectural, engineering, and related services	5413	40,928	6.0	0.8	57.8	35.4	5.6	0.8	70.2	23.4	5.1	0.3	72.3	22.3	6.2	0.8	72.0	21.0
Specialized design services	5414	13,714	4.9	0.9	47.1	47.0	2.9	1.0	59.7	36.4	2.3	D	54.8	42.6	2.3	0.8	r 56.5	40.4
Computer systems design and related services	5415	63,324	7.2	0.9	56.0	35.9	5.7	1.5	66.6	26.2	4.8	1.1	68.2	25.9	7.6	1.3	66.4	24.7
Management, scientific, and technical consulting services	5416	64,022	4.7	0.8	42.5	52.0	5.0	1.2	58.4	35.4	4.5	0.9	56.4	38.2	6.2	1.5	56.2	36.1
Scientific research and development services	5417	4,188	6.5	1.0	54.2	38.3	7.1	1.4	74.8	16.7	7.4	1.3	73.9	17.4	8.9	1.4	74.8	14.9
Advertising, public relations, and related services	5418	15,388	5.6	1.7	46.1	46.6	6.5	2.8	61.3	29.4	5.0	1.5	62.6	30.9	6.4	2.7	62.7	28.2
Other professional, scientific, and technical services	5419	24,167	5.0	0.7	r 52.0	42.3	3.9	1.3	64.3	30.5	3.6	1.1	63.7	31.6	5.3	0.9	65.0	28.8
Management of companies and enterprises	55	806	0.0	0.0	43.4	56.6	19.9	D	49.3	30.5	D	D	55.8	30.5	D	D	60.8	25.7
Administrative and support and waste management and remediation services	56	85,414	8.7	1.2	50.4	39.7	6.6	2.1	64.3	27.0	7.0	1.2	68.5	23.3	9.1	1.4	67.5	22.0

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Educational services	61	23,127	4.2	1.0	38.6	56.2	5.8	1.3	59.4	33.5	8.3	1.4	58.9	31.4	7.3	2.0	63.5	27.2
Health care and social assistance	62	202,410	5.2	1.1	48.5	45.3	5.2	1.4	64.6	28.8	4.8	1.2	68.1	25.9	6.7	1.7	68.8	22.8
Health care services	621–23	184,835	5.1	1.2	49.7	44.0	5.0	1.4	65.4	28.2	4.4	1.2	68.4	26.0	6.4	1.7	69.3	22.6
Social assistance	624	17,574	5.5	D	35.7	58.5	7.9	1.3	r 55.4	35.4	9.4	0.8	64.9	24.9	10.4	2.0	62.7	24.9
Arts, entertainment, and recreation	71	28,512	1.8	0.8	44.1	53.3	4.0	1.0	59.5	35.5	4.4	0.4	59.2	36.0	4.8	1.0	62.6	31.6
Accommodation and food services	72	94,504	5.7	2.7	56.1	35.5	3.9	3.0	65.4	27.7	5.8	2.5	71.2	20.5	5.5	3.0	71.9	19.6
Other services	81	70,105	6.5	1.6	57.1	34.8	4.5	1.3	66.4	27.8	4.6	1.1	68.0	26.3	6.0	1.4	69.0	23.6

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.

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.