



National Center for Science and  
Engineering Statistics

# Annual Business Survey: 2019 (Data Year 2018)

Data Tables | NSF 22-315 | March 04, 2022

## Contents

---

General Notes	2
Data Tables	3
Technical Notes	333
Technical Tables	342
Acknowledgments and Suggested Citation	348
Contact Us	349

---

## General Notes

---

This report provides data from the 2019 Annual Business Survey (ABS) (data year 2018). The ABS is the primary source of data on research and development of for-profit, nonfarm businesses with one to nine employees operating in the 50 U.S. states and the District of Columbia. The ABS also collects data on innovation, technology, intellectual property, and business owner characteristics of business of all sizes. The ABS is designed to incorporate new content each survey year based on topics of relevance. The 2019 ABS is the second year of the ABS. The survey is conducted annually by the Census Bureau for the National Center for Science and Engineering Statistics within the National Science Foundation.

## Data Tables

---

### Survey aggregate estimates: 2018

Table	Title
1	Annual Business Survey aggregate sales estimates, by questionnaire reference and employment size: 2018
2	Annual Business Survey aggregate R&D estimates, by questionnaire reference and employment size, for companies with 1–9 employees: 2018

### Total R&D cost, by industry, employment size, sex, and race and ethnicity: 2018

Table	Title
3	Total R&D cost, by selected industry and employment size, for companies with 1–9 employees: 2018
4	Domestic R&D performed by the company, by selected industry and employment size, for companies with 1–9 employees: 2018
5	Domestic R&D performed by the company, by firm classification of sex and employment size, for companies with 1–9 employees: 2018
6	Domestic R&D performed by the company, by firm classification of race and ethnicity and employment size, for companies with 1–9 employees: 2018
7-1	Domestic R&D performed by the company, by selected industry and R&D program size, for companies with 1–9 employees: 2018
7-2	Domestic R&D performed by the company, by selected industry and R&D program size, for companies with 1–4 employees: 2018
7-3	Domestic R&D performed by the company, by selected industry and R&D program size, for companies with 5–9 employees: 2018
8-1	Domestic R&D costs, by selected industry and type of cost, for companies with 1–9 employees: 2018
8-2	Domestic R&D costs, by selected industry and type of cost, for companies with 1–4 employees: 2018
8-3	Domestic R&D costs, by selected industry and type of cost, for companies with 5–9 employees: 2018
9-1	Domestic R&D performed by the company, by selected industry and source of funds, for companies with 1–9 employees: 2018
9-2	Domestic R&D performed by the company, by selected industry and source of funds, for companies with 1–4 employees: 2018

Table	Title
9-3	Domestic R&D performed by the company, by selected industry and source of funds, for companies with 5–9 employees: 2018
10-1	Domestic R&D performed by the company, by selected industry and type of R&D, for companies with 1–9 employees: 2018
10-2	Domestic R&D performed by the company, by selected industry and type of R&D, for companies with 1–4 employees: 2018
10-3	Domestic R&D performed by the company, by selected industry and type of R&D, for companies with 5–9 employees: 2018
11	Domestic sales and domestic R&D performed by the company as a percentage of domestic sales, by selected industry and employment size, for companies with 1–9 employees: 2018
12	Domestic R&D performed by the company, by state and employment size, for companies with 1–9 employees: 2018
13	Domestic R&D performed by the company, by state and source of funds, for companies with 1–9 employees: 2018

## R&D employees: 2018

Table	Title
14	R&D employees, by selected industry and employment size, for companies with 1–9 employees: 2018
15	R&D employees, by selected industry and sex, for companies with 1–9 employees: 2018
16	Domestic R&D employees, by selected industry, R&D occupation, and education, for companies with 1–9 employees: 2018
17	Domestic full-time equivalent R&D employees, by selected industry and occupation, for companies with 1–9 employees: 2018

## R&D tax credit: 2018

Table	Title
18-1	Tax credit for research activities for companies with R&D expenditures and 1–9 employees, by industry: 2018
18-2	Tax credit for research activities for companies with R&D expenditures and 1–4 employees, by industry: 2018
18-3	Tax credit for research activities for companies with R&D expenditures and 5–9 employees, by industry: 2018

## Product innovation: 2016–18

Table	Title
19	Product innovating companies, by industry: 2016–18
20	Product innovating companies, by size of company: 2016–18
21	Product innovating companies, by firm classification of sex: 2016–18
22	Product innovating companies, by firm classification of race and ethnicity: 2016–18
23	Product innovating companies, by state: 2016–18
24	Goods innovating companies, by industry: 2016–18
25	Goods innovating companies, by size of company: 2016–18
26	Services innovating companies, by industry: 2016–18
27	Services innovating companies, by size of company: 2016–18

## Business process innovation: 2016–18

Table	Title
28	Business process innovating companies, by industry: 2016–18
29	Business process innovating companies, by size of company: 2016–18
30	Business process innovating companies, by firm classification of sex: 2016–18
31	Business process innovating companies, by firm classification of race and ethnicity: 2016–18
32	Business process innovating companies, by state: 2016–18

## New or improved business processes: 2016–18

Table	Title
33	Companies with new or improved business processes: Methods for producing goods or providing services, by industry: 2016–18
34	Companies with new or improved business processes: Methods for producing goods or providing services, by size of company: 2016–18

Table	Title
35	Companies with new or improved business processes: Logistics, delivery, or distribution methods, by industry: 2016–18
36	Companies with new or improved business processes: Logistics, delivery, or distribution methods, by size of company: 2016–18
37	Companies with new or improved business processes: Marketing methods, by industry: 2016–18
38	Companies with new or improved business processes: Marketing methods, by size of company: 2016–18
39	Companies with new or improved business processes: Information and communication systems, by industry: 2016–18
40	Companies with new or improved business processes: Information and communication systems, by size of company: 2016–18
41	Companies with new or improved business processes: Administration and management activities, by industry: 2016–18
42	Companies with new or improved business processes: Administration and management activities, by size of company: 2016–18
43	Companies with new or improved business processes: Product and business process development activities, by industry: 2016–18
44	Companies with new or improved business processes: Product and business process development activities, by size of company: 2016–18

## Product or business process innovation: 2016–18

Table	Title
45	Companies with product or business process innovation, by industry: 2016–18
46	Companies with product or business process innovation, by size of company: 2016–18
47	Companies with product or business process innovation, by firm classification of sex: 2016–18
48	Companies with product or business process innovation, by firm classification of race and ethnicity: 2016–18
49	Companies with product or business process innovation, by state: 2016–18

## Innovation and R&D activity: 2016–18

Table	Title
50	Companies that reported product innovation, by industry and innovation R&D activity: 2016–18
51	Companies that reported product innovation, by size of company and innovation R&D activity: 2016–18
52	Companies that reported product innovation, by firm classification of sex and innovation R&D activity: 2016–18
53	Companies that reported product innovation, by firm classification of race and ethnicity and innovation R&D activity: 2016–18
54	Companies that reported business process innovation by industry and innovation R&D activity: 2016–18
55	Companies that reported business process innovation, by size of company and innovation R&D activity: 2016–18
56	Companies that reported business process innovation, by firm classification of sex and innovation R&D activity: 2016–18
57	Companies that reported business process innovation, by firm classification of race and ethnicity and innovation R&D activity: 2016–18
58	Companies that reported product or business process innovation, by industry and innovation R&D activity: 2016–18
59	Companies that reported product or business process innovation, by size of company and innovation R&D activity: 2016–18
60	Companies that reported product or business process innovation, by firm classification of sex and innovation R&D activity: 2016–18
61	Companies that reported product or business process innovation, by firm classification of race and ethnicity and innovation R&D activity: 2016–18

## Product or business process innovation: 2016–18

Table	Title
62	Companies with product or business process innovation activities, by company size: 2016–18

## New to market product innovation: 2016–18

Table	Title
63	Companies with new-to-market product innovation, by industry: 2016–18

Table	Title
-------	-------

64	Companies with new-to-market product innovation, by company size: 2016–18
----	---

65	Companies with new-to-market product innovation, by innovation R&D activity: 2016–18
----	--

## New to market business process innovation: 2016–18

Table	Title
-------	-------

66	Companies with new-to-the-business product innovation, by industry: 2016–18
----	---

67	Companies with new-to-the-business product innovation, by company size: 2016–18
----	---

68	Companies with new-to-the-business product innovation, by innovation R&D activity: 2016–18
----	--

## Innovation activity costs: 2016–18

Table	Title
-------	-------

69	Total innovation activity costs, by industry and employment size: 2018
----	--

70	Innovation activity costs for R&D, by industry and employment size: 2018
----	--

## Importance of intellectual property: 2018

Table	Title
-------	-------

71-1	Importance of intellectual property protection, by type: 2018
------	---

71-2	Importance of intellectual property protection, by type, for companies with 1–9 employees: 2018
------	---

71-3	Importance of intellectual property protection, by type, for companies with 10 or more employees: 2018
------	--

72	Importance of utility patents, by industry: 2018
----	--

73	Importance of utility patents, by company size: 2018
----	--

74	Importance of design patents, by industry: 2018
----	---

75	Importance of design patents, by company size: 2018
----	---

76	Importance of trademarks, by industry: 2018
----	---

77	Importance of trademarks, by company size: 2018
----	---



Table	Title
78	Importance of copyrights, by industry: 2018
79	Importance of copyrights, by company size: 2018
80	Importance of trade secrets, by industry: 2018
81	Importance of trade secrets, by company size: 2018
82	Importance of nondisclosure agreements, by industry: 2018
83	Importance of nondisclosure agreements, by company size: 2018

### **Artificial intelligence as a production technology: 2016–18**

Table	Title
84	Use of artificial intelligence as a production technology for goods and services, by industry: 2016–18
85	Use of artificial intelligence as a production technology for goods and services, by company size: 2016–18

### **Cloud-based computing systems and applications as a production technology: 2016–18**

Table	Title
86	Use of cloud-based computing systems and applications as a production technology for goods and services, by industry: 2016–18
87	Use of cloud-based computing systems and applications as a production technology for goods and services, by company size: 2016–18

### **Specialized software as a production technology: 2016–18**

Table	Title
88	Use of specialized software as a production technology for goods and services, by industry: 2016–18
89	Use of specialized software as a production technology for goods and services, by company size: 2016–18

## Robotics as a production technology: 2016–18

Table	Title
90	Use of robotics as a production technology for goods and services, by industry: 2016–18
91	Use of robotics as a production technology for goods and services, by company size: 2016–18

## Specialized equipment as a production technology: 2016–18

Table	Title
92	Use of specialized equipment as a production technology for goods and services, by industry: 2016–18
93	Use of specialized equipment as a production technology for goods and services, by company size: 2016–18

## Artificial intelligence - motivation and impact: 2016–18

Table	Title
94	Motivation for artificial intelligence technology adoption and utilization for companies using the technology, by industry: 2016–18
95	Impact of artificial intelligence technology on skill level of workforce, by industry: 2016–18
96	Impact of artificial intelligence technology on worker types, by industry: 2016–18

## Cloud-based computing systems and applications - motivation and impact: 2016–18

Table	Title
97	Motivation for cloud-based computing systems and applications technology adoption and utilization for companies using the technology, by industry: 2016–18
98	Impact of cloud-based computing systems and applications technology on skill level of workforce, by industry: 2016–18
99	Impact of cloud-based computing systems and applications technology on worker types, by industry: 2016–18

## Specialized software - motivation and impact: 2016–18

Table	Title
100	Motivation for specialized software technology adoption and utilization for companies using the technology, by industry: 2016–18

Table	Title
-------	-------

101	Impact of specialized software technology on skill level of workforce, by industry: 2016–18
-----	---

102	Impact of specialized software technology on worker types, by industry: 2016–18
-----	---

## Robotics - motivation and impact: 2016–18

Table	Title
-------	-------

103	Motivation for robotics technology adoption and utilization for companies using the technology, by industry: 2016–18
-----	--

104	Impact of robotics technology on skill level of workforce, by industry: 2016–18
-----	---

105	Impact of robotics technology on worker types, by industry: 2016–18
-----	---

## Specialized equipment - motivation and impact: 2016–18

Table	Title
-------	-------

106	Motivation for specialized equipment technology adoption and utilization for companies using the technology, by industry: 2016–18
-----	---

107	Impact of specialized equipment technology on skill level of workforce, by industry: 2016–18
-----	--

108	Impact of specialized equipment technology on worker types, by industry: 2016–18
-----	--

## Factors adversely affecting technology adoption and utilization: 2016–18

Table	Title
-------	-------

109	Factors adversely affecting technology adoption and utilization, by industry—artificial intelligence: 2016–18
-----	---

110	Factors adversely affecting technology adoption and utilization, by industry—cloud-based computing systems and applications: 2016–18
-----	--

111	Factors adversely affecting technology adoption and utilization, by industry—specialized software: 2016–18
-----	--

112	Factors adversely affecting technology adoption and utilization, by industry—robotics: 2016–18
-----	--

113	Factors adversely affecting technology adoption and utilization, by industry—specialized equipment: 2016–18
-----	---

## Companies that reported selling artificial intelligence: 2016–18

Table	Title
114	Companies that reported selling artificial intelligence or goods and services that included artificial intelligence, by industry: 2016–18
115	Companies that reported selling artificial intelligence or goods and services that included artificial intelligence, by company size: 2016–18

## Companies that reported selling cloud-based computing systems and applications: 2016–18

Table	Title
116	Companies that reported selling cloud-based computing systems and applications or goods and services that included cloud-based computing systems and applications, by industry: 2016–18
117	Companies that reported selling cloud-based computing systems and applications or goods and services that included cloud-based computing systems and applications, by company size: 2016–18

## Companies that reported selling specialized software: 2016–18

Table	Title
118	Companies that reported selling specialized software or goods and services that included specialized software, by industry: 2016–18
119	Companies that reported selling specialized software or goods and services that included specialized software, by company size: 2016–18

## Companies that reported selling robotics: 2016–18

Table	Title
120	Companies that reported selling robotics or goods and services that included robotics, by industry: 2016–18
121	Companies that reported selling robotics or goods and services that included robotics, by company size: 2016–18

## Companies that reported selling specialized equipment: 2016–18

Table	Title
122	Companies that reported selling specialized equipment or goods and services that included specialized equipment, by industry: 2016–18
123	Companies that reported selling specialized equipment or goods and services that included specialized equipment, by company size: 2016–18

## Artificial intelligence production- motivation and impact: 2016–18

Table	Title
124	Motivations for companies producing artificial intelligence or goods or services with artificial intelligence, by industry: 2016–18
125	Impact of producing artificial intelligence or goods or services with artificial intelligence on skill level of workforce, by industry: 2016–18
126	Impact of producing artificial intelligence or goods or services with artificial intelligence on worker types, by industry: 2016–18

## Cloud-based computing systems and applications production- motivation and impact: 2016–18

Table	Title
127	Motivations for companies producing cloud-based computing systems and applications or goods or services with cloud-based computing systems and applications, by industry: 2016–18
128	Impact of producing cloud-based computing systems and applications or goods or services with cloud-based computing systems and applications on skill level of workforce, by industry: 2016–18
129	Impact of producing cloud-based computing systems and applications or goods or services with cloud-based computing systems and applications on worker types, by industry: 2016–18

## Specialized software production- motivation and impact: 2016–18

Table	Title
130	Motivations for companies producing specialized software or goods or services with specialized software, by industry: 2016–18
131	Impact of producing specialized software or goods or services with specialized software on skill level of workforce, by industry: 2016–18

Table	Title
132	Impact of producing specialized software or goods or services with specialized software on worker types, by industry: 2016–18

## Robotics production- motivation and impact: 2016–18

Table	Title
133	Motivations for companies producing robotics or goods or services with robotics, by industry: 2016–18
134	Impact of producing robotics or goods or services with robotics on skill level of workforce, by industry: 2016–18
135	Impact of producing robotics or goods or services with robotics on worker types, by industry: 2016–18

## Specialized equipment production- motivation and impact: 2016–18

Table	Title
136	Motivations for companies producing specialized equipment or goods or services with specialized equipment, by industry: 2016–18
137	Impact of producing specialized equipment or goods or services with specialized equipment on skill level of workforce, by industry: 2016–18
138	Impact of producing specialized equipment or goods or services with specialized equipment on worker types, by industry: 2016–18

## Factors adversely affecting production of artificial intelligence: 2016–18

Table	Title
139	Factors adversely affecting production of artificial intelligence or goods or services that included artificial intelligence, by industry: 2016–18
140	Factors adversely affecting production of artificial intelligence or goods or services that included artificial intelligence, by company size: 2016–18

## Factors adversely affecting production of cloud-based computing systems and applications: 2016–18

Table Title

---

**141** Factors adversely affecting production of cloud-based computing systems and applications or goods or services that included cloud-based computing systems and applications, by industry: 2016–18

---

**142** Factors adversely affecting production of cloud-based computing systems and applications or goods or services that included cloud-based computing systems and applications, by company size: 2016–18

---

## Factors adversely affecting production of specialized software: 2016–18

Table Title

---

**143** Factors adversely affecting production of specialized software or goods or services that included specialized software, by industry: 2016–18

---

**144** Factors adversely affecting production of specialized software or goods or services that included specialized software, by company size: 2016–18

---

## Factors adversely affecting production of robotics: 2016–18

Table Title

---

**145** Factors adversely affecting production of robotics or goods or services that included robotics, by industry: 2016–18

---

**146** Factors adversely affecting production of robotics or goods or services that included robotics, by company size: 2016–18

---

## Factors adversely affecting production of specialized equipment: 2016–18

Table Title

---

**147** Factors adversely affecting production of specialized equipment or goods or services that included specialized equipment, by industry: 2016–18

---

**148** Factors adversely affecting production of specialized equipment or goods or services that included specialized equipment, by company size: 2016–18

---

TABLE 1

**Annual Business Survey aggregate sales estimates, by questionnaire reference and employment size: 2018**

(Thousands of U.S. dollars)

Company and financial information	All companies	1–9 employees	10–49 employees	50–249 employees	250 or more employees
Number of companies	4,805,151	3,604,301	981,711	185,063	34,078
Worldwide sales, revenues, and grants	35,955,226,362	3,694,724,564	3,612,467,803	3,780,254,807	24,867,779,187
Sales and revenues from U.S. operations	29,734,544,321	3,077,000,850	3,175,958,677	3,517,980,579	19,963,604,216

**Note(s):**

Detail may not add to total because of rounding. 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.



TABLE 2

**Annual Business Survey aggregate R&D estimates, by questionnaire reference and employment size, for companies with 1–9 employees: 2018**

(Thousands of U.S. dollars)

Company and financial information	All companies	1–4 employees	5–9 employees
Number of companies	12,975	7,843	5,133
Total R&D cost	6,467,338	2,644,204	3,823,134
Foreign R&D costs	700,609	326,353	374,256
Domestic R&D costs	5,766,729	2,317,852	3,448,877
Domestic R&D costs for salaries, wages, and benefits	2,818,156	1,122,207	1,695,949
Domestic R&D costs for expensed machinery and equipment (not capitalized)	163,888	86,736	77,152
Domestic R&D costs for materials and supplies	425,260	187,470	237,790
Domestic R&D costs for payments to others for R&D	1,239,892	427,124	812,768
Domestic R&D costs for depreciation on R&D property and equipment	60,036	26,662	33,374
Domestic R&D costs for other costs	1,059,498	467,652	591,846
Domestic R&D performance	4,526,838	1,890,728	2,636,110
Domestic R&D performance paid for by company	3,570,660	1,408,768	2,161,892
Domestic R&D performance paid for by foreign owner	175,207	65,659	109,548
Domestic R&D performance paid for by another U.S. business	196,003	109,838	86,165
Domestic R&D performance paid for other businesses located outside the United States	34,019	18,875	15,144
Domestic R&D performance paid for by U.S. university or college	10,459	3,956	6,503
Domestic R&D performance paid for by U.S. nonprofit organization	13,871	7,552	6,319
Domestic R&D performance paid for by U.S. federal government	506,856	263,610	243,246
Domestic R&D performance paid for by U.S. state or local government	17,078	11,321	5,757
Domestic R&D performance paid for by all other organizations outside the United States	2,685 r	1,149 r	1,536 r
Domestic R&D performance for basic research	224,480	93,473	131,007
Domestic R&D performance for applied research	1,365,493	635,779	729,714
Domestic R&D performance for development	2,936,865	1,161,476	1,775,389

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. Statistics are representative of companies located in the United States that performed or funded R&amp;D.

**Source(s):**

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

TABLE 3

**Total R&D cost, by selected industry and employment size, for companies with 1–9 employees: 2018**

(Number of companies and thousands of U.S. dollars)

Industry	NAICS code	All companies		1–4 employees		5–9 employees	
		Companies (number)	Amount	Companies (number)	Amount	Companies (number)	Amount
All selected industries	31–33, 42, 51, 5413, 5415, 5417	12,975	6,467,338	7,843	2,644,204	5,133	3,823,134
Manufacturing industries	31–33	1,889	702,414	1,006	283,315	884	419,098
Food, beverage, and tobacco products	311–12	D	D	D	D	0	0
Textile, apparel, and leather products	313–16	10	1,147	D	D	D	D
Wood products	321	0	0	0	0	0	0
Paper	322	0	0	0	0	0	0
Printing and related support activities	323	D	D	D	D	0	0
Petroleum and coal products	324	D	D	0	0	D	D
Chemicals	325	274	149,323	136	59,785	139	89,538
Pharmaceuticals and medicines	3254	165	116,392	83	34,982	83	81,410
Chemicals, excluding pharmaceuticals	other 325	110	32,931	54	24,803	55	8,128
Plastics and rubber products	326	0	0	0	0	0	0
Nonmetallic mineral products	327	15	5,500	D	D	D	D
Primary metals	331	0	0	0	0	0	0
Fabricated metal products	332	18	2,929	D	D	D	D
Machinery	333	135	51,732	103	21,535	32	30,197
Computer and electronic products	334	998	349,148	436	101,257	564	247,891
Semiconductor and other electronic components	3344	201	71,181	81	19,253	121	51,928
Navigational, measuring, electromedical, and control instruments	3345	533	226,247	245	63,345	286	162,902
Other computer and electronic products	other 334	266	51,720	111	18,660	157	33,060
Electrical equipment, appliances, and components	335	173	32,218	112	13,087	62	19,131
Transportation equipment	336	41	14,537	26	6,596	14	7,940
Aerospace products and parts	3364	33	11,210	20	4,183	12	7,027
Other transportation equipment	other 336	D	D	D	D	D	D
Furniture and related products	337	0	0	0	0	0	0
Miscellaneous manufacturing	339	212	91,811	162	74,866	51	16,944
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	11,085	5,764,924	6,836	2,360,889	4,248	3,404,035
Wholesale trade	42	505	232,405	185	91,329	320	141,077
Information	51	1,801	660,724	908	249,646	894	411,078
Software publishers	5112	1,268	497,414	612	193,662	656	303,751
Information, excluding software publishers	51, excluding 5112	534	163,311	296	55,983	237	107,327
Architectural, engineering, and related services	5413	1,256	488,940	888	270,447	369	218,493
Computer systems design and related services	5415	4,639	1,311,905	3,013	566,128	1,625	745,776
Scientific research and development services	5417	2,883	3,070,951	1,840	1,183,340	1,042	1,887,611
Research and development in nanotechnology	541713	572	351,183	350	150,936	223	200,247

TABLE 3

**Total R&D cost, by selected industry and employment size, for companies with 1–9 employees: 2018**

(Number of companies and thousands of U.S. dollars)

Industry	NAICS code	All companies		1–4 employees		5–9 employees	
		Companies (number)	Amount	Companies (number)	Amount	Companies (number)	Amount
Research and development in biotechnology (except nanobiotechnology)	541714	838	1,481,240	535	512,808	302	968,432
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	1,408	1,201,469	919	513,868	488	687,601
Social sciences and humanities research and development	541720	32	14,839	18	2,864	12	11,976

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error &gt; 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 that performed or funded R&D.

**Source(s):**

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

TABLE 4

**Domestic R&D performed by the company, by selected industry and employment size, for companies with 1–9 employees: 2018**

(Number of companies and thousands of U.S. dollars)

Industry	NAICS code	All companies		1–4 employees		5–9 employees	
		Companies (number)	Amount	Companies (number)	Amount	Companies (number)	Amount
All selected industries	31–33, 42, 51, 5413, 5415, 5417	12,541	4,526,838	7,545	1,890,728	4,997	2,636,110
Manufacturing industries	31–33	1,824	555,676	968	231,973	857	323,702
Food, beverage, and tobacco products	311–12	D	D	D	D	0	0
Textile, apparel, and leather products	313–16	10	859 r	D	D	D	D
Wood products	321	0	0	0	0	0	0
Paper	322	0	0	0	0	0	0
Printing and related support activities	323	D	D	D	D	0	0
Petroleum and coal products	324	D	D	0	0	D	D
Chemicals	325	265	86,272	128	47,522	138	38,750
Pharmaceuticals and medicines	3254	159	54,581	78	23,204	82	31,377
Chemicals, excluding pharmaceuticals	other 325	107	31,691	51	24,318 r	55	7,373
Plastics and rubber products	326	0	0	0	0	0	0
Nonmetallic mineral products	327	15 r	5,159 r	D	D	D	D
Primary metals	331	0	0	0	0	0	0
Fabricated metal products	332	18 r	2,465 r	D	D	D	D
Machinery	333	135	42,431	103 r	19,021	32	23,410 r
Computer and electronic products	334	962	303,711	421	87,587	542	216,124
Semiconductor and other electronic components	3344	186	56,813	81	17,009	106	39,804
Navigational, measuring, electromedical, and control instruments	3345	515	200,704	235	55,113	279	145,591
Other computer and electronic products	other 334	263	46,194	107	15,465	157	30,729
Electrical equipment, appliances, and components	335	167	27,954	106	12,096	62	15,858
Transportation equipment	336	41	12,979	26	6,185	14	6,794
Aerospace products and parts	3364	33	10,181	20	3,844	12	6,337
Other transportation equipment	other 336	D	D	D	D	D	D
Furniture and related products	337	0	0	0	0	0	0
Miscellaneous manufacturing	339	198	69,921	152	54,146	47	15,775
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	10,716	3,971,162	6,575	1,658,754	4,140	2,312,408
Wholesale trade	42	500	183,533	185	71,988	315	111,545
Information	51	1,771	518,090	892	165,875	879	352,215
Software publishers	5112	1,242	368,288	598	117,048	642	251,241
Information, excluding software publishers	51, excluding 5112	530	149,801	293	48,827	236	100,975
Architectural, engineering, and related services	5413	1,215	411,987	871	228,243	345	183,744
Computer systems design and related services	5415	4,407	1,037,581	2,830	446,671	1,576	590,910
Scientific research and development services	5417	2,824	1,819,972	1,796	745,978	1,027	1,073,994
Research and development in nanotechnology	541713	561	292,766	347	119,572	215	173,194

TABLE 4

**Domestic R&D performed by the company, by selected industry and employment size, for companies with 1–9 employees: 2018**

(Number of companies and thousands of U.S. dollars)

Industry	NAICS code	All companies		1–4 employees		5–9 employees	
		Companies (number)	Amount	Companies (number)	Amount	Companies (number)	Amount
Research and development in biotechnology (except nanobiotechnology)	541714	803	656,579	500	266,279	302	390,300
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	1,395	841,697	914	354,602	481	487,094
Social sciences and humanities research and development	541720	32	12,008	18	2,864	12	9,144

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error &gt; 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 that performed or funded R&D.

**Source(s):**

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

TABLE 5

**Domestic R&D performed by the company, by firm classification of sex and employment size, for companies with 1–9 employees: 2018**

(Number of companies and thousands of U.S. dollars)

Sex of owners	All companies		1–4 employees		5–9 employees	
	Companies (number)	Amount	Companies (number)	Amount	Companies (number)	Amount
All companies (sex of owner)	12,541	4,526,838	7,545	1,890,728	4,997	2,636,110
Female majority owned	1,424	469,243	837	242,663	586	226,580
Male majority owned	9,430	3,252,267	5,697	1,352,508	3,732	1,899,759
Equally owned by male and female	1,117	260,886	772	148,802	346	112,084
Unclassifiable	571	544,441	238	146,755	334	397,686

**Note(s):**

Detail may not add to total because of rounding. Statistics are representative of companies located in the United States that performed or funded R&D.

**Source(s):**

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

TABLE 6

**Domestic R&D performed by the company, by firm classification of race and ethnicity and employment size, for companies with 1–9 employees: 2018**

(Number of companies and thousands of U.S. dollars)

Race and ethnicity of owners	All companies		1–4 employees		5–9 employees	
	Companies (number)	Amount	Companies (number)	Amount	Companies (number)	Amount
All companies (race and ethnicity)	12,541	4,526,838	7,545	1,890,728	4,997	2,636,110
Race						
White	9,115	3,037,788	5,556	1,343,833	3,558	1,693,955
Asian	2,570	847,584	1,553	322,705	1,019	524,879
Black or African American	120	37,075	70	18,908	51 r	18,167 r
American Indian or Alaska Native	28 r	6,185	10	4,876	D	D
Native Hawaiian or Other Pacific Islander	7 r	1,097 r	7 r	1,097 r	0	0
Ethnicity						
Hispanic or Latino	392	98,314	254	39,435	138	58,879
Equally Hispanic and not Hispanic	141	23,080	55 r	9,045	86	14,035 r
Not Hispanic	11,436	3,861,003	6,997	1,695,493	4,440	2,165,510
Minority status						
Minority	3,113	991,639	1,891	389,769	1,223	601,870
Black or African American, American Indian or Alaska Native, or Hispanic or Latino	533	141,353	329	63,079	203	78,274
Equally minority and nonminority	464	142,596	265	81,155 r	198	61,441
Nonminority	8,392	2,848,162	5,147	1,273,049	3,244	1,575,113
Unclassifiable	571	544,441	238	146,755	334	397,686

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

**Note(s):**

Detail may not add to total because of rounding. Companies may be included in one or more race and ethnicity category. Companies classified as "minority" are those companies classified as any race and ethnicity combination other than not Hispanic and White. Statistics are representative of companies located in the United States that performed or funded R&D.

**Source(s):**

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

TABLE 7-1

**Domestic R&D performed by the company, by selected industry and R&D program size, for companies with 1–9 employees: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	R&D program size (total)				
		Total	\$50,000– \$99,999	\$100,000– \$499,999	\$500,000– \$999,999	\$1 million or more
All selected industries	31–33, 42, 51, 5413, 5415, 5417	4,526,838	161,444	1,299,329	1,104,986	1,961,079
Manufacturing industries	31–33	555,676	29,557	179,568	86,721	259,829
Food, beverage, and tobacco products	311–12	D	0	D	0	0
Textile, apparel, and leather products	313–16	859 r	D	D	0	0
Wood products	321	0	0	0	0	0
Paper	322	0	0	0	0	0
Printing and related support activities	323	D	0	D	0	0
Petroleum and coal products	324	D	0	D	0	0
Chemicals	325	86,272	5,839	17,947	20,746	41,740
Pharmaceuticals and medicines	3254	54,581	3,107	10,349	19,232	21,893
Chemicals, excluding pharmaceuticals	other 325	31,691	2,732	7,598	D	D
Plastics and rubber products	326	0	0	0	0	0
Nonmetallic mineral products	327	5,159 r	0	5,159 r	0	0
Primary metals	331	0	0	0	0	0
Fabricated metal products	332	2,465 r	D	D	D	0
Machinery	333	42,431	1,400 r	10,979	D	D
Computer and electronic products	334	303,711	17,643	99,162	31,434	155,472
Semiconductor and other electronic components	3344	56,813	2,653	21,708	D	31,564 r
Navigational, measuring, electromedical, and control instruments	3345	200,704	9,389	50,911	19,817	120,588
Other computer and electronic products	other 334	46,194	5,601	26,544	10,729	D
Electrical equipment, appliances, and components	335	27,954	2,652	16,317	0	D
Transportation equipment	336	12,979	730 r	5,103	3,690	D
Aerospace products and parts	3364	10,181	730 r	2,305	3,690	D
Other transportation equipment	other 336	D	0	D	0	0
Furniture and related products	337	0	0	0	0	0
Miscellaneous manufacturing	339	69,921	803	19,188	19,990	29,939
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	3,971,162	131,887	1,119,761	1,018,265	1,701,249
Wholesale trade	42	183,533	D	73,372	88,580	20,761
Information	51	518,090	22,095	180,040	145,759	170,196
Software publishers	5112	368,288	14,826	121,391	99,851	132,220
Information, excluding software publishers	51, excluding 5112	149,801	7,269	58,649	45,908	37,976 r
Architectural, engineering, and related services	5413	411,987	9,047	144,520	200,282	58,138
Computer systems design and related services	5415	1,037,581	80,117	452,253	201,540	303,670
Scientific research and development services	5417	1,819,972	19,809	269,576	382,104	1,148,484
Research and development in nanotechnology	541713	292,766	4,047	55,634	92,932	140,153
Research and development in biotechnology (except nanobiotechnology)	541714	656,579	4,992	65,298	91,426	494,863
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	841,697	9,963	142,510	192,164	497,059
Social sciences and humanities research and development	541720	12,008	D	4,295	D	D



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 that performed or funded R&D.

**Source(s):**

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

TABLE 7-2

**Domestic R&D performed by the company, by selected industry and R&D program size, for companies with 1–4 employees: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	R&D program size (total)				
		Total	\$50,000– \$99,999	\$100,000– \$499,999	\$500,000– \$999,999	\$1 million or more
All selected industries	31–33, 42, 51, 5413, 5415, 5417	1,890,728	121,245	791,474	502,084	475,925
Manufacturing industries	31–33	231,973	15,317	92,074	51,599	72,984
Food, beverage, and tobacco products	311–12	D	0	D	0	0
Textile, apparel, and leather products	313–16	D	D	D	0	0
Wood products	321	0	0	0	0	0
Paper	322	0	0	0	0	0
Printing and related support activities	323	D	0	D	0	0
Petroleum and coal products	324	0	0	0	0	0
Chemicals	325	47,522	3,170	7,960	6,491	29,900
Pharmaceuticals and medicines	3254	23,204	1,594	5,066	6,491	10,053
Chemicals, excluding pharmaceuticals	other 325	24,318 r	1,576 r	2,894	0	D
Plastics and rubber products	326	0	0	0	0	0
Nonmetallic mineral products	327	D	0	D	0	0
Primary metals	331	0	0	0	0	0
Fabricated metal products	332	D	D	D	0	0
Machinery	333	19,021	D	8,365 r	D	0
Computer and electronic products	334	87,587	7,990	41,387	17,507	20,703
Semiconductor and other electronic components	3344	17,009	788	8,999	0	D
Navigational, measuring, electromedical, and control instruments	3345	55,113	5,274	21,775	14,582 r	13,482 r
Other computer and electronic products	other 334	15,465	1,927	10,613	D	0
Electrical equipment, appliances, and components	335	12,096	1,474 r	10,622	0	0
Transportation equipment	336	6,185	730 r	3,269 r	D	0
Aerospace products and parts	3364	3,844	730 r	D	D	0
Other transportation equipment	other 336	D	0	D	0	0
Furniture and related products	337	0	0	0	0	0
Miscellaneous manufacturing	339	54,146	623	15,545 r	15,598 r	22,380
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	1,658,754	105,928	699,400	450,485	402,941
Wholesale trade	42	71,988	D	35,543 r	D	D
Information	51	165,875	16,693	79,910	28,045	41,227
Software publishers	5112	117,048	12,168	48,459	15,194	41,227
Information, excluding software publishers	51, excluding 5112	48,827	4,525	31,450	12,852	0
Architectural, engineering, and related services	5413	228,243	7,940	112,014	91,640	16,648 r
Computer systems design and related services	5415	446,671	63,350	275,377	88,353	19,591
Scientific research and development services	5417	745,978	17,126	196,557	209,993	322,302
Research and development in nanotechnology	541713	119,572	3,497	38,419	46,640 r	31,015
Research and development in biotechnology (except nanobiotechnology)	541714	266,279	4,144	42,797	56,855	162,483
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	354,602	8,762	111,573	105,464	128,804
Social sciences and humanities research and development	541720	2,864	D	2,597	0	0

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error &gt; 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 that performed or funded R&D.

**Source(s):**

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

TABLE 7-3

**Domestic R&D performed by the company, by selected industry and R&D program size, for companies with 5–9 employees: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	R&D program size (total)				
		Total	\$50,000– \$99,999	\$100,000– \$499,999	\$500,000– \$999,999	\$1 million or more
All selected industries	31–33, 42, 51, 5413, 5415, 5417	2,636,110	40,199	507,855	602,901	1,485,154
Manufacturing industries	31–33	323,702	14,240	87,494	35,122	186,846
Food, beverage, and tobacco products	311–12	0	0	0	0	0
Textile, apparel, and leather products	313–16	D	0	D	0	0
Wood products	321	0	0	0	0	0
Paper	322	0	0	0	0	0
Printing and related support activities	323	0	0	0	0	0
Petroleum and coal products	324	D	0	D	0	0
Chemicals	325	38,750	2,669	9,987	14,254	11,840 r
Pharmaceuticals and medicines	3254	31,377	1,514	5,283	12,740 r	11,840 r
Chemicals, excluding pharmaceuticals	other 325	7,373	1,156	4,703	D	0
Plastics and rubber products	326	0	0	0	0	0
Nonmetallic mineral products	327	D	0	D	0	0
Primary metals	331	0	0	0	0	0
Fabricated metal products	332	D	0	0	D	0
Machinery	333	23,410 r	559 r	D	0	D
Computer and electronic products	334	216,124	9,653	57,775	13,927	134,769
Semiconductor and other electronic components	3344	39,804	1,864 r	12,709	D	24,342 r
Navigational, measuring, electromedical, and control instruments	3345	145,591	4,114	29,136	5,234 r	107,106 r
Other computer and electronic products	other 334	30,729	3,675	15,930	D	D
Electrical equipment, appliances, and components	335	15,858	1,178	5,696	0	D
Transportation equipment	336	6,794	0	1,834	D	D
Aerospace products and parts	3364	6,337	0	1,377	D	D
Other transportation equipment	other 336	D	0	D	0	0
Furniture and related products	337	0	0	0	0	0
Miscellaneous manufacturing	339	15,775	D	3,643	D	7,559 r
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	2,312,408	25,959	420,361	567,779	1,298,308
Wholesale trade	42	111,545	0	37,829	D	17,589
Information	51	352,215	5,402	100,130	117,714	128,969
Software publishers	5112	251,241	2,658	72,932	84,658	90,993
Information, excluding software publishers	51, excluding 5112	100,975	2,745	27,198	33,056	37,976 r
Architectural, engineering, and related services	5413	183,744	1,106 r	32,506	108,642 r	41,489 r
Computer systems design and related services	5415	590,910	16,768	176,877	113,187	284,079
Scientific research and development services	5417	1,073,994	2,683	73,019	172,110	826,182
Research and development in nanotechnology	541713	173,194	D	17,215	46,292	109,137
Research and development in biotechnology (except nanobiotechnology)	541714	390,300	848	22,501	34,571	332,380
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	487,094	1,202	30,937	86,700	368,255
Social sciences and humanities research and development	541720	9,144	D	D	D	D

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error &gt; 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 that performed or funded R&D.

**Source(s):**

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

TABLE 8-1

**Domestic R&D costs, by selected industry and type of cost, for companies with 1–9 employees: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Salaries, wages, and fringe benefits	Expensed machinery and equipment	Materials and supplies	Payments to others for R&D	Depreciation on R&D property and equipment	All other costs
All selected industries	31–33, 42, 51, 5413, 5415, 5417	5,766,729	2,818,156	163,888	425,260	1,239,892	60,036	1,059,498
Manufacturing industries	31–33	655,018	325,923	47,471	74,693	99,342	8,733	98,855
Food, beverage, and tobacco products	311–12	D	D	0	D	D	0	D
Textile, apparel, and leather products	313–16	1,025	770	D	D	D	0	0
Wood products	321	0	0	0	0	0	0	0
Paper	322	0	0	0	0	0	0	0
Printing and related support activities	323	D	D	D	D	D	0	D
Petroleum and coal products	324	D	D	D	D	D	0	D
Chemicals	325	125,099	46,701	11,377	11,951	38,827	962	15,280
Pharmaceuticals and medicines	3254	92,531	29,778	3,233	9,798	37,950	709	11,063
Chemicals, excluding pharmaceuticals	other 325	32,568	16,923	8,144	2,153	877	254	4,217
Plastics and rubber products	326	0	0	0	0	0	0	0
Nonmetallic mineral products	327	5,500	3,170	436	683	341	D	445
Primary metals	331	0	0	0	0	0	0	0
Fabricated metal products	332	2,929	D	D	D	D	D	D
Machinery	333	49,419	25,497	2,247	11,493	6,987	D	2,748
Computer and electronic products	334	331,600	190,494	27,263	33,353	27,889	5,647	46,954
Semiconductor and other electronic components	3344	59,688	43,243	1,665	3,073	2,875	574	8,259
Navigational, measuring, electromedical, and control instruments	3345	223,576	116,839	24,572	24,959	22,872	4,598	29,736
Other computer and electronic products	other 334	48,336	30,412	1,026	5,321	2,142	476	8,959
Electrical equipment, appliances, and components	335	30,428	18,784	1,251	3,645	2,473	447	3,828
Transportation equipment	336	14,405	7,118	1,384	2,071	1,426	335	2,071
Aerospace products and parts	3364	11,150	5,152	1,233	1,558	969	275	1,963
Other transportation equipment	other 336	D	D	D	D	D	D	D
Furniture and related products	337	0	0	0	0	0	0	0
Miscellaneous manufacturing	339	90,544	30,247	2,397	10,432	20,624	434	26,410
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	5,111,711	2,492,233	116,416	350,567	1,140,549	51,303	960,643
Wholesale trade	42	227,178	119,051	4,840	8,892	43,646	D	50,052
Information	51	538,573	431,564	9,725	10,431	20,483	1,932	64,438
Software publishers	5112	382,680	314,643	6,801	5,029	14,391	1,276	40,539

TABLE 8-1

**Domestic R&D costs, by selected industry and type of cost, for companies with 1–9 employees: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Salaries, wages, and fringe benefits	Expensed machinery and equipment	Materials and supplies	Payments to others for R&D	Depreciation on R&D property and equipment	All other costs
Information, excluding software publishers	51, excluding 5112	155,893	116,921	2,923	5,402	6,092	655 r	23,899
Architectural, engineering, and related services	5413	446,173	229,675	14,068	58,120	34,186	6,525	103,598
Computer systems design and related services	5415	1,122,849	733,908	31,402	46,745	85,268	11,068	214,458
Scientific research and development services	5417	2,776,938	978,035	56,382	226,379	956,966	31,081	528,095
Research and development in nanotechnology	541713	331,590	175,622	11,052	31,125	38,824	6,154	68,812
Research and development in biotechnology (except nanobiotechnology)	541714	1,307,901	318,847	11,996	86,881	651,322	9,217	229,638
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	1,102,490	466,911	32,562	105,618	260,793	15,139	221,466
Social sciences and humanities research and development	541720	14,839	8,282	250 r	541	D	D	2,877

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error &gt; 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 that performed or funded R&amp;D.

**Source(s):**

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

TABLE 8-2

## Domestic R&amp;D costs, by selected industry and type of cost, for companies with 1–4 employees: 2018

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Salaries, wages, and fringe benefits	Expensed machinery and equipment	Materials and supplies	Payments to others for R&D	Depreciation on R&D property and equipment	All other costs	
All selected industries	31–33, 42, 51, 5413, 5415, 5417	2,317,852	1,122,207	86,736	187,470	427,124	26,662	467,652	
Manufacturing industries	31–33	272,489	121,932	23,995	30,319	40,516	2,712	53,015	
Food, beverage, and tobacco products	311–12	D	D	0	D	D	0	D	
Textile, apparel, and leather products	313–16	D	D	0	D	D	0	0	
Wood products	321	0	0	0	0	0	0	0	
Paper	322	0	0	0	0	0	0	0	
Printing and related support activities	323	D	D	D	D	D	0	D	
Petroleum and coal products	324	0	0	0	0	0	0	0	
Chemicals	325	55,824	23,579	9,371	6,187	8,303	724	7,661	
Pharmaceuticals and medicines	3254	31,324	11,354	1,590	5,019	8,120	561	4,680	
Chemicals, excluding pharmaceuticals	other 325	24,500	r 12,225	r 7,781	r 1,168	183	163	2,981	r
Plastics and rubber products	326	0	0	0	0	0	0	0	
Nonmetallic mineral products	327	D	D	D	D	D	0	D	
Primary metals	331	0	0	0	0	0	0	0	
Fabricated metal products	332	D	D	D	D	D	D	D	
Machinery	333	20,444	11,230	2,017	r 3,939	r 1,424	r D	1,830	r
Computer and electronic products	334	97,049	51,634	9,229	r 9,019	9,462	1,310	16,394	
Semiconductor and other electronic components	3344	17,868	13,095	319	635	859	r 397	r 2,562	r
Navigational, measuring, electromedical, and control instruments	3345	62,152	28,960	8,460	r 6,809	7,039	615	r 10,268	
Other computer and electronic products	other 334	17,028	9,579	449	1,575	1,563	299	3,564	
Electrical equipment, appliances, and components	335	12,246	8,277	263	1,875	151	r D	1,629	
Transportation equipment	336	6,464	3,109	913	r 1,384	279	r 202	577	
Aerospace products and parts	3364	4,123	1,600	762	r 871	279	r 142	r 469	r
Other transportation equipment	other 336	D	D	D	D	0	D	D	
Furniture and related products	337	0	0	0	0	0	0	0	
Miscellaneous manufacturing	339	74,272	21,159	1,679	r 7,301	20,125	382	r 23,625	
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	2,045,363	1,000,275	62,740	157,151	386,608	23,950	414,638	
Wholesale trade	42	91,212	44,631	r 3,019	r 6,546	r 19,225	r 0	17,792	r
Information	51	173,023	124,962	3,051	3,025	7,149	1,176	33,660	
Software publishers	5112	122,486	88,288	2,162	1,943	5,439	1,015	23,640	
Information, excluding software publishers	51, excluding 5112	50,537	36,674	889	1,082	1,710	162	r 10,020	
Architectural, engineering, and related services	5413	255,880	138,062	9,741	38,035	27,637	3,941	38,464	



TABLE 8-2

**Domestic R&D costs, by selected industry and type of cost, for companies with 1–4 employees: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Salaries, wages, and fringe benefits	Expensed machinery and equipment	Materials and supplies	Payments to others for R&D	Depreciation on R&D property and equipment	All other costs
Computer systems design and related services	5415	479,777	320,046	24,221	14,690	33,107	7,706 r	80,007
Scientific research and development services	5417	1,045,470	372,574	22,708	94,855	299,491	11,127	244,714
Research and development in nanotechnology	541713	140,193	69,990	3,314	10,676	20,621	2,314	33,278
Research and development in biotechnology (except nanobiotechnology)	541714	413,090	104,101	5,816	39,819	146,811	5,247	111,296
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	486,474	194,887	13,442	43,973	131,872	3,547	98,753
Social sciences and humanities research and development	541720	2,864	2,288	D	212 r	0	0	318

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 that performed or funded R&D.

**Source(s):**

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

TABLE 8-3

**Domestic R&D costs, by selected industry and type of cost, for companies with 5–9 employees: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Salaries, wages, and fringe benefits	Expensed machinery and equipment	Materials and supplies	Payments to others for R&D	Depreciation on R&D property and equipment	All other costs
All selected industries	31–33, 42, 51, 5413, 5415, 5417	3,448,877	1,695,949	77,152	237,790	812,768	33,374	591,846
Manufacturing industries	31–33	382,529	203,990	23,476	44,374	58,827	6,021	45,841
Food, beverage, and tobacco products	311–12	0	0	0	0	0	0	0
Textile, apparel, and leather products	313–16	D	D	D	D	0	0	0
Wood products	321	0	0	0	0	0	0	0
Paper	322	0	0	0	0	0	0	0
Printing and related support activities	323	0	0	0	0	0	0	0
Petroleum and coal products	324	D	D	D	D	D	0	D
Chemicals	325	69,274	23,122	2,006	5,764	30,524	239	7,618
Pharmaceuticals and medicines	3254	61,207	18,424	1,643	4,779	29,830	148	6,383
Chemicals, excluding pharmaceuticals	other 325	8,068	4,699	363 r	985	695 r	91	1,236
Plastics and rubber products	326	0	0	0	0	0	0	0
Nonmetallic mineral products	327	D	D	D	D	D	D	D
Primary metals	331	0	0	0	0	0	0	0
Fabricated metal products	332	D	D	D	D	0	0	0
Machinery	333	28,974 r	14,267 r	229 r	7,554 r	D	D	918 r
Computer and electronic products	334	234,551	138,859	18,035 r	24,333	18,427	4,337 r	30,560
Semiconductor and other electronic components	3344	41,819	30,147 r	1,346	2,437	2,015	176	5,697
Navigational, measuring, electromedical, and control instruments	3345	161,424	87,879	16,112 r	18,150	15,833	3,983 r	19,468
Other computer and electronic products	other 334	31,308	20,833	577	3,747	579 r	178 r	5,395
Electrical equipment, appliances, and components	335	18,181 r	10,507 r	988 r	1,770 r	2,323 r	394 r	2,199 r
Transportation equipment	336	7,940	4,009	471	687	1,147	D	1,494 r
Aerospace products and parts	3364	7,027	3,552	471	687	D	D	1,494 r
Other transportation equipment	other 336	D	D	0	0	D	0	0
Furniture and related products	337	0	0	0	0	0	0	0
Miscellaneous manufacturing	339	16,273	9,088	718	3,132 r	498 r	D	2,786
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	3,066,349	1,491,958	53,676	193,416	753,941	27,353	546,005
Wholesale trade	42	135,966	74,420	1,821	2,345	24,421 r	D	32,260
Information	51	365,550	306,602	6,674	7,406	13,334	755	30,778
Software publishers	5112	260,193	226,355	4,639	3,086 r	8,953	262 r	16,899
Information, excluding software publishers	51, excluding 5112	105,356	80,247	2,035	4,320	4,382	494 r	13,879
Architectural, engineering, and related services	5413	190,293	91,614	4,327	20,086	6,549	2,584	65,134

TABLE 8-3

**Domestic R&D costs, by selected industry and type of cost, for companies with 5–9 employees: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Salaries, wages, and fringe benefits	Expensed machinery and equipment	Materials and supplies	Payments to others for R&D	Depreciation on R&D property and equipment	All other costs
Computer systems design and related services	5415	643,072	413,862	7,181	32,055	52,161	3,362	134,451 r
Scientific research and development services	5417	1,731,468	605,461	33,673	131,524	657,475	19,954	283,381
Research and development in nanotechnology	541713	191,397	105,632	7,738	20,450	18,203	3,840	35,534
Research and development in biotechnology (except nanobiotechnology)	541714	894,811	214,747	6,180	47,062	504,511 r	3,969	118,342
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	616,016	272,024	19,120	61,644	128,921	11,592	122,714
Social sciences and humanities research and development	541720	11,976	5,994	D	330	D	D	2,559

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 that performed or funded R&D.

**Source(s):**

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

TABLE 9-1

## Domestic R&amp;D performed by the company, by selected industry and source of funds, for companies with 1–9 employees: 2018

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Paid for by the company	Foreign owner	Another U.S. company	Other businesses outside the United States	U.S. university or college	U.S. nonprofit organization	U.S. federal government	U.S. state or local government	All other organizations outside the United States
All selected industries	31–33, 42, 51, 5413, 5415, 5417	4,526,838	3,570,660	175,207	196,003	34,019	10,459	13,871	506,856	17,078	2,685 r
Manufacturing industries	31–33	555,676	485,450	16,203 r	9,378	1,325	168	3,459	36,435	2,515	744 r
Food, beverage, and tobacco products	311–12	D	0	0	0	0	0	0	D	0	0
Textile, apparel, and leather products	313–16	859 r	859 r	0	0	0	0	0	0	0	0
Wood products	321	0	0	0	0	0	0	0	0	0	0
Paper	322	0	0	0	0	0	0	0	0	0	0
Printing and related support activities	323	D	D	0	0	0	0	0	0	0	0
Petroleum and coal products	324	D	D	0	0	0	D	0	0	0	0
Chemicals	325	86,272	70,652	9,990 r	734	902	D	D	2,273	D	D
Pharmaceuticals and medicines	3254	54,581	41,432	D	734	D	D	D	1,173 r	0	0
Chemicals, excluding pharmaceuticals	other 325	31,691	29,220	D	0	D	D	0	1,100	D	D
Plastics and rubber products	326	0	0	0	0	0	0	0	0	0	0
Nonmetallic mineral products	327	5,159 r	4,981 r	0	D	0	0	0	0	0	0
Primary metals	331	0	0	0	0	0	0	0	0	0	0
Fabricated metal products	332	2,465 r	D	0	0	0	0	0	D	0	0
Machinery	333	42,431	30,360 r	D	D	0	0	0	8,259 r	D	D
Computer and electronic products	334	303,711	280,244	5,693	3,018	266 r	116 r	2,083 r	11,562	626	D
Semiconductor and other electronic components	3344	56,813	50,819	D	D	0	D	D	2,627	D	0
Navigational, measuring, electromedical, and control instruments	3345	200,704	186,974	D	2,251	D	D	D	6,067	459	D
Other computer and electronic products	other 334	46,194	42,451	0	732	D	0	0	D	0	D
Electrical equipment, appliances, and components	335	27,954	22,791	0	D	D	0	0	D	0	0
Transportation equipment	336	12,979	11,581	0	D	0	0	0	D	0	0
Aerospace products and parts	3364	10,181	8,783	0	D	0	0	0	D	0	0
Other transportation equipment	other 336	D	D	0	0	0	0	0	0	0	0
Furniture and related products	337	0	0	0	0	0	0	0	0	0	0
Miscellaneous manufacturing	339	69,921	58,982	D	D	0	0	D	9,197 r	D	0
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	3,971,162	3,085,210	159,004	186,625	32,694	10,291	10,412	470,422	14,563	1,941 r
Wholesale trade	42	183,533	153,989	D	0	0	0	0	D	0	0
Information	51	518,090	496,623	3,445	4,943	D	D	D	10,530	D	D

TABLE 9-1

**Domestic R&D performed by the company, by selected industry and source of funds, for companies with 1–9 employees: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Paid for by the company	Foreign owner	Another U.S. company	Other businesses outside the United States	U.S. university or college	U.S. nonprofit organization	U.S. federal government	U.S. state or local government	All other organizations outside the United States
Software publishers	5112	368,288	354,181	2,574	2,702	D	D	0	7,327	D	D
Information, excluding software publishers	51, excluding 5112	149,801	142,442	D	2,241 r	0	D	D	3,203	0	0
Architectural, engineering, and related services	5413	411,987	290,228	0	71,069 r	12,688 r	3,523 r	D	33,196	615 r	D
Computer systems design and related services	5415	1,037,581	899,993	11,450 r	58,946	D	D	D	65,678	D	0
Scientific research and development services	5417	1,819,972	1,244,377	140,577	51,667	19,315	5,622	8,657	335,006	13,190	1,562 r
Research and development in nanotechnology	541713	292,766	207,792	10,015 r	16,536	1,247 r	1,812 r	D	53,413	1,886 r	D
Research and development in biotechnology (except nanobiotechnology)	541714	656,579	471,921	61,395	9,869	10,268	1,218	385 r	95,997	4,116	D
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	841,697	546,569	67,492 r	25,262	7,167	2,592	4,171 r	181,144	7,188	D
Social sciences and humanities research and development	541720	12,008	8,585	0	0	0	0	0	3,424	0	0

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error &gt; 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 that performed or funded R&amp;D.

**Source(s):**

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

TABLE 9-2

## Domestic R&amp;D performed by the company, by selected industry and source of funds, for companies with 1–4 employees: 2018

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Paid for by the company	Foreign owner	Another U.S. company	Other businesses outside the United States	U.S. university or college	U.S. nonprofit organization	U.S. federal government	U.S. state or local government	All other organizations outside the United States
All selected industries	31–33, 42, 51, 5413, 5415, 5417	1,890,728	1,408,768	65,659	109,838	18,875	3,956	7,552	263,610	11,321	1,149 r
Manufacturing industries	31–33	231,973	188,223	4,637 r	6,372	1,093	116 r	1,416 r	27,920	1,536 r	663 r
Food, beverage, and tobacco products	311–12	D	0	0	0	0	0	0	D	0	0
Textile, apparel, and leather products	313–16	D	D	0	0	0	0	0	0	0	0
Wood products	321	0	0	0	0	0	0	0	0	0	0
Paper	322	0	0	0	0	0	0	0	0	0	0
Printing and related support activities	323	D	D	0	0	0	0	0	0	0	0
Petroleum and coal products	324	0	0	0	0	0	0	0	0	0	0
Chemicals	325	47,522	42,282	D	399	D	D	D	1,640	0	D
Pharmaceuticals and medicines	3254	23,204	19,233	D	399	D	D	D	1,108 r	0	0
Chemicals, excluding pharmaceuticals	other 325	24,318 r	23,050 r	D	0	D	0	0	D	0	D
Plastics and rubber products	326	0	0	0	0	0	0	0	0	0	0
Nonmetallic mineral products	327	D	D	0	D	0	0	0	0	0	0
Primary metals	331	0	0	0	0	0	0	0	0	0	0
Fabricated metal products	332	D	D	0	0	0	0	0	D	0	0
Machinery	333	19,021	10,491 r	0	D	0	0	0	6,172 r	D	D
Computer and electronic products	334	87,587	74,132	D	2,246	D	D	D	7,168	278	D
Semiconductor and other electronic components	3344	17,009	14,502	D	D	0	D	D	1,531 r	D	0
Navigational, measuring, electromedical, and control instruments	3345	55,113	47,197	D	D	D	D	0	2,770	D	0
Other computer and electronic products	other 334	15,465	12,432	0	D	D	0	0	D	0	D
Electrical equipment, appliances, and components	335	12,096	7,905	0	D	0	0	0	D	0	0
Transportation equipment	336	6,185	5,718	0	0	0	0	0	D	0	0
Aerospace products and parts	3364	3,844	3,377	0	0	0	0	0	D	0	0
Other transportation equipment	other 336	D	D	0	0	0	0	0	0	0	0
Furniture and related products	337	0	0	0	0	0	0	0	0	0	0
Miscellaneous manufacturing	339	54,146	43,826	0	D	0	0	D	9,197 r	D	0
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	1,658,754	1,220,546	61,023	103,466	17,783	3,840	6,136	235,690	9,785	486 r
Wholesale trade	42	71,988	71,988	0	0	0	0	0	0	0	0
Information	51	165,875	148,960	2,801	3,370	D	D	0	8,680	D	D

TABLE 9-2

**Domestic R&D performed by the company, by selected industry and source of funds, for companies with 1–4 employees: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Paid for by the company	Foreign owner	Another U.S. company	Other businesses outside the United States	U.S. university or college	U.S. nonprofit organization	U.S. federal government	U.S. state or local government	All other organizations outside the United States
Software publishers	5112	117,048	104,832	1,930	2,531	D	D	0	6,365 r	D	D
Information, excluding software publishers	51, excluding 5112	48,827	44,128	D	D	0	D	0	2,315	0	0
Architectural, engineering, and related services	5413	228,243	152,348	0	44,346	12,688 r	D	D	17,443	D	0
Computer systems design and related services	5415	446,671	373,410	D	33,861	0	0	D	31,321 r	D	0
Scientific research and development services	5417	745,978	473,840	50,620 r	21,889	5,016	2,249	5,465	178,247	8,502	D
Research and development in nanotechnology	541713	119,572	85,648	D	2,528	D	D	D	30,519	385 r	D
Research and development in biotechnology (except nanobiotechnology)	541714	266,279	168,175	44,511 r	3,742	2,465 r	829	385 r	44,306	1,867 r	0
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	354,602	217,252	6,083	15,619	2,380	1,191	4,019 r	101,696	6,250	D
Social sciences and humanities research and development	541720	2,864	1,138 r	0	0	0	0	0	1,725 r	0	0

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error &gt; 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 that performed or funded R&amp;D.

**Source(s):**

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

TABLE 9-3

## Domestic R&amp;D performed by the company, by selected industry and source of funds, for companies with 5–9 employees: 2018

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Paid for by the company	Foreign owner	Another U.S. company	Other businesses outside the United States	U.S. university or college	U.S. nonprofit organization	U.S. federal government	U.S. state or local government	All other organizations outside the United States
All selected industries	31–33, 42, 51, 5413, 5415, 5417	2,636,110	2,161,892	109,548	86,165	15,144	6,503	6,319	243,246	5,757	1,536 r
Manufacturing industries	31–33	323,702	297,227	11,566 r	3,006	232 r	52 r	D	8,515	979 r	D
Food, beverage, and tobacco products	311–12	0	0	0	0	0	0	0	0	0	0
Textile, apparel, and leather products	313–16	D	D	0	0	0	0	0	0	0	0
Wood products	321	0	0	0	0	0	0	0	0	0	0
Paper	322	0	0	0	0	0	0	0	0	0	0
Printing and related support activities	323	0	0	0	0	0	0	0	0	0	0
Petroleum and coal products	324	D	D	0	0	0	D	0	0	0	0
Chemicals	325	38,750	28,370	D	335	D	D	0	D	D	0
Pharmaceuticals and medicines	3254	31,377	22,199	D	335	D	0	0	D	0	0
Chemicals, excluding pharmaceuticals	other 325	7,373	6,171	0	0	0	D	0	D	D	0
Plastics and rubber products	326	0	0	0	0	0	0	0	0	0	0
Nonmetallic mineral products	327	D	D	0	0	0	0	0	0	0	0
Primary metals	331	0	0	0	0	0	0	0	0	0	0
Fabricated metal products	332	D	D	0	0	0	0	0	0	0	0
Machinery	333	23,410 r	19,869 r	D	D	0	0	0	2,087 r	0	0
Computer and electronic products	334	216,124	206,112	D	773	D	D	D	4,394	348	D
Semiconductor and other electronic components	3344	39,804	36,317	D	D	0	D	0	1,096 r	0	0
Navigational, measuring, electromedical, and control instruments	3345	145,591	139,777	0	D	D	0	D	3,298	348	D
Other computer and electronic products	other 334	30,729	30,019	0	711	0	0	0	0	0	0
Electrical equipment, appliances, and components	335	15,858	14,886	0	D	D	0	0	D	0	0
Transportation equipment	336	6,794	5,863	0	D	0	0	0	D	0	0
Aerospace products and parts	3364	6,337	5,406 r	0	D	0	0	0	D	0	0
Other transportation equipment	other 336	D	D	0	0	0	0	0	0	0	0
Furniture and related products	337	0	0	0	0	0	0	0	0	0	0
Miscellaneous manufacturing	339	15,775	15,156	D	D	0	0	0	0	0	0
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	2,312,408	1,864,665	97,982	83,159	14,911	6,451	4,276 r	234,731	4,778	D
Wholesale trade	42	111,545	82,001	D	0	0	0	0	D	0	0
Information	51	352,215	347,663	D	D	D	0	D	1,850	0	0



TABLE 9-3

**Domestic R&D performed by the company, by selected industry and source of funds, for companies with 5–9 employees: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Paid for by the company	Foreign owner	Another U.S. company	Other businesses outside the United States	U.S. university or college	U.S. nonprofit organization	U.S. federal government	U.S. state or local government	All other organizations outside the United States
Software publishers	5112	251,241	249,349	D	D	D	0	0	D	0	0
Information, excluding software publishers	51, excluding 5112	100,975	98,314	0	D	0	0	D	888	0	0
Architectural, engineering, and related services	5413	183,744	137,880	0	26,723 r	0	3,005 r	D	15,753	D	D
Computer systems design and related services	5415	590,910	526,582	D	25,085	D	D	D	34,358 r	0	0
Scientific research and development services	5417	1,073,994	770,537	89,957	29,778	14,300	3,373 r	D	156,759	4,688	D
Research and development in nanotechnology	541713	173,194	122,144	D	14,008	D	1,583 r	0	22,894	1,501 r	0
Research and development in biotechnology (except nanobiotechnology)	541714	390,300	303,746	16,885	6,127	7,803	D	0	51,691	2,249 r	D
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	487,094	329,317	61,409 r	9,643	4,787 r	1,401 r	D	79,447	938	0
Social sciences and humanities research and development	541720	9,144	7,446 r	0	0	0	0	0	D	0	0

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error &gt; 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 that performed or funded R&amp;D.

**Source(s):**

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

TABLE 10-1

**Domestic R&D performed by the company, by selected industry and type of R&D, for companies with 1–9 employees: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Basic research	Applied research	Development
All selected industries	31–33, 42, 51, 5413, 5415, 5417	4,526,838	224,480	1,365,493	2,936,865
Manufacturing industries	31–33	555,676	49,533	180,583	325,559
Food, beverage, and tobacco products	311–12	D	0	D	0
Textile, apparel, and leather products	313–16	859 r	0	859 r	0
Wood products	321	0	0	0	0
Paper	322	0	0	0	0
Printing and related support activities	323	D	0	D	D
Petroleum and coal products	324	D	D	D	D
Chemicals	325	86,272	4,385	33,276	48,611
Pharmaceuticals and medicines	3254	54,581	2,801	26,337	25,443
Chemicals, excluding pharmaceuticals	other 325	31,691	1,583	6,939	23,169 r
Plastics and rubber products	326	0	0	0	0
Nonmetallic mineral products	327	5,159 r	162 r	1,084 r	3,913 r
Primary metals	331	0	0	0	0
Fabricated metal products	332	2,465 r	D	D	918
Machinery	333	42,431	6,448 r	20,151	15,832
Computer and electronic products	334	303,711	26,553	93,347	183,811
Semiconductor and other electronic components	3344	56,813	1,943 r	18,177	36,692
Navigational, measuring, electromedical, and control instruments	3345	200,704	21,524 r	61,629	117,551
Other computer and electronic products	other 334	46,194	3,086	13,541	29,567
Electrical equipment, appliances, and components	335	27,954	2,031 r	7,613	18,310
Transportation equipment	336	12,979	256 r	3,591	9,132
Aerospace products and parts	3364	10,181	256 r	1,964	7,962
Other transportation equipment	other 336	D	0	D	D
Furniture and related products	337	0	0	0	0
Miscellaneous manufacturing	339	69,921	9,062	17,024 r	43,835
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	3,971,162	174,947	1,184,910	2,611,305
Wholesale trade	42	183,533	6,546	31,199 r	145,788
Information	51	518,090	25,486	105,320	387,284
Software publishers	5112	368,288	16,822	77,207	274,260
Information, excluding software publishers	51, excluding 5112	149,801	8,664	28,113	113,025
Architectural, engineering, and related services	5413	411,987	15,960	119,239	276,788
Computer systems design and related services	5415	1,037,581	57,312	237,917	742,352
Scientific research and development services	5417	1,819,972	69,643	691,236	1,059,093
Research and development in nanotechnology	541713	292,766	9,149	111,002	172,615
Research and development in biotechnology (except nanobiotechnology)	541714	656,579	22,146	227,757	406,676
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	841,697	36,854	337,943	466,900
Social sciences and humanities research and development	541720	12,008	D	6,631	4,149

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error &gt; 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 that performed or funded R&amp;D.

**Source(s):**

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

TABLE 10-2

**Domestic R&D performed by the company, by selected industry and type of R&D, for companies with 1–4 employees: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Basic research	Applied research	Development
All selected industries	31–33, 42, 51, 5413, 5415, 5417	1,890,728	93,473	635,779	1,161,476
Manufacturing industries	31–33	231,973	16,317	93,085	122,571
Food, beverage, and tobacco products	311–12	D	0	D	0
Textile, apparel, and leather products	313–16	D	0	D	0
Wood products	321	0	0	0	0
Paper	322	0	0	0	0
Printing and related support activities	323	D	0	D	D
Petroleum and coal products	324	0	0	0	0
Chemicals	325	47,522	2,770	14,566	30,185
Pharmaceuticals and medicines	3254	23,204	1,602	9,778	11,825
Chemicals, excluding pharmaceuticals	other 325	24,318	r 1,169	4,789	18,360
Plastics and rubber products	326	0	0	0	0
Nonmetallic mineral products	327	D	D	D	D
Primary metals	331	0	0	0	0
Fabricated metal products	332	D	D	D	D
Machinery	333	19,021	D	12,050	r 6,842
Computer and electronic products	334	87,587	7,129	r 44,007	36,451
Semiconductor and other electronic components	3344	17,009	336	11,769	4,904
Navigational, measuring, electromedical, and control instruments	3345	55,113	4,735	r 25,125	25,253
Other computer and electronic products	other 334	15,465	2,058	r 7,114	6,293
Electrical equipment, appliances, and components	335	12,096	653	r 3,342	8,101
Transportation equipment	336	6,185	D	1,790	r 4,225
Aerospace products and parts	3364	3,844	D	619	r 3,054
Other transportation equipment	other 336	D	0	D	D
Furniture and related products	337	0	0	0	0
Miscellaneous manufacturing	339	54,146	5,205	r 14,115	r 34,827
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	1,658,754	77,155	542,694	1,038,905
Wholesale trade	42	71,988	414	r 3,809	67,765
Information	51	165,875	11,112	40,259	114,504
Software publishers	5112	117,048	5,923	30,555	80,570
Information, excluding software publishers	51, excluding 5112	48,827	5,189	9,704	33,934
Architectural, engineering, and related services	5413	228,243	9,093	76,893	142,257
Computer systems design and related services	5415	446,671	30,581	121,604	294,485
Scientific research and development services	5417	745,978	25,955	300,129	419,894
Research and development in nanotechnology	541713	119,572	3,477	42,538	73,557
Research and development in biotechnology (except nanobiotechnology)	541714	266,279	7,737	102,932	155,610
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	354,602	14,710	151,382	188,511
Social sciences and humanities research and development	541720	2,864	0	1,986	877

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error &gt; 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 that performed or funded R&amp;D.

**Source(s):**

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

TABLE 10-3

**Domestic R&D performed by the company, by selected industry and type of R&D, for companies with 5–9 employees: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Basic research	Applied research	Development
All selected industries	31–33, 42, 51, 5413, 5415, 5417	2,636,110	131,007	729,714	1,775,389
Manufacturing industries	31–33	323,702	33,215	87,498	202,988
Food, beverage, and tobacco products	311–12	0	0	0	0
Textile, apparel, and leather products	313–16	D	0	D	0
Wood products	321	0	0	0	0
Paper	322	0	0	0	0
Printing and related support activities	323	0	0	0	0
Petroleum and coal products	324	D	D	D	D
Chemicals	325	38,750	1,614	18,709	18,426
Pharmaceuticals and medicines	3254	31,377	1,199	16,559	13,618
Chemicals, excluding pharmaceuticals	other 325	7,373	415	2,150	4,808
Plastics and rubber products	326	0	0	0	0
Nonmetallic mineral products	327	D	D	D	D
Primary metals	331	0	0	0	0
Fabricated metal products	332	D	D	D	D
Machinery	333	23,410	6,320	8,101	8,990
Computer and electronic products	334	216,124	19,425	49,340	147,360
Semiconductor and other electronic components	3344	39,804	1,608	6,409	31,788
Navigational, measuring, electromedical, and control instruments	3345	145,591	16,789	36,504	92,298
Other computer and electronic products	other 334	30,729	1,028	6,427	23,274
Electrical equipment, appliances, and components	335	15,858	D	4,271	10,209
Transportation equipment	336	6,794	D	1,801	4,907
Aerospace products and parts	3364	6,337	D	1,344	4,907
Other transportation equipment	other 336	D	0	D	0
Furniture and related products	337	0	0	0	0
Miscellaneous manufacturing	339	15,775	3,858	2,909	9,008
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	2,312,408	97,791	642,216	1,572,400
Wholesale trade	42	111,545	6,132	27,390	78,023
Information	51	352,215	14,374	65,061	272,780
Software publishers	5112	251,241	10,899	46,652	193,690
Information, excluding software publishers	51, excluding 5112	100,975	3,475	18,409	79,090
Architectural, engineering, and related services	5413	183,744	6,866	42,346	134,532
Computer systems design and related services	5415	590,910	26,731	116,313	447,866
Scientific research and development services	5417	1,073,994	43,688	391,107	639,199
Research and development in nanotechnology	541713	173,194	5,672	68,464	99,058
Research and development in biotechnology (except nanobiotechnology)	541714	390,300	14,410	124,825	251,066
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	487,094	22,144	186,562	278,388
Social sciences and humanities research and development	541720	9,144	D	4,645	3,271

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error &gt; 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 that performed or funded R&amp;D.

**Source(s):**

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

TABLE 11

**Domestic sales and domestic R&D performed by the company as a percentage of domestic sales, by selected industry and employment size, for companies with 1–9 employees: 2018**

(Thousands of U.S. dollars and percentage of sales)

Industry	NAICS code	All companies		1–4 employees		5–9 employees	
		Total sales	R&D as a percentage of sales	Total sales	R&D as a percentage of sales	Total sales	R&D as a percentage of sales
All selected industries	31–33, 42, 51, 5413, 5415, 5417	10,620,355	43	4,192,541	45	6,427,814	41
Manufacturing industries	31–33	1,972,820	28	824,010	28	1,148,809	28
Food, beverage, and tobacco products	311–12	D	D	D	D	0	0
Textile, apparel, and leather products	313–16	21,572	4	D	D	D	D
Wood products	321	0	0	0	0	0	0
Paper	322	0	0	0	0	0	0
Printing and related support activities	323	0	0	0	0	0	0
Petroleum and coal products	324	D	D	0	0	D	D
Chemicals	325	537,969	16	302,479	16	235,490	16
Pharmaceuticals and medicines	3254	381,157	14	233,977	10	147,180	21
Chemicals, excluding pharmaceuticals	other 325	156,812	20	68,502	36	88,310	8
Plastics and rubber products	326	0	0	0	0	0	0
Nonmetallic mineral products	327	6,087	85	D	D	D	D
Primary metals	331	0	0	0	0	0	0
Fabricated metal products	332	D	D	D	D	D	D
Machinery	333	32,095	132	11,132	171	20,963	112
Computer and electronic products	334	967,367	31	259,051	34	708,315	30
Semiconductor and other electronic components	3344	185,176	31	52,804	32	132,372	30
Navigational, measuring, electromedical, and control instruments	3345	528,298	38	149,199	37	379,099	38
Other computer and electronic products	other 334	253,893	18	57,048	27	196,844	16
Electrical equipment, appliances, and components	335	257,278	11	157,058	8	100,220	16
Transportation equipment	336	14,759	88	7,593	82	7,166	95
Aerospace products and parts	3364	9,550	107	3,320	116	6,230	102
Other transportation equipment	other 336	D	D	D	D	D	D
Furniture and related products	337	0	0	0	0	0	0
Miscellaneous manufacturing	339	102,468	68	64,371	84	38,097	41
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	8,647,536	46	3,368,531	49	5,279,005	44
Wholesale trade	42	353,446	52	74,552	97	278,894	40
Information	51	1,766,962	29	564,000	29	1,202,962	29
Software publishers	5112	1,188,994	31	224,713	52	964,281	26
Information, excluding software publishers	51, excluding 5112	577,968	26	339,287	14	238,681	42
Architectural, engineering, and related services	5413	1,629,615	25	485,345	47	1,144,270	16
Computer systems design and related services	5415	3,302,812	31	1,467,300	30	1,835,512	32
Scientific research and development services	5417	1,594,700	114	777,333	96	817,367	131



TABLE 11

**Domestic sales and domestic R&D performed by the company as a percentage of domestic sales, by selected industry and employment size, for companies with 1–9 employees: 2018**

(Thousands of U.S. dollars and percentage of sales)

Industry	NAICS code	All companies		1–4 employees		5–9 employees	
		Total sales	R&D as a percentage of sales	Total sales	R&D as a percentage of sales	Total sales	R&D as a percentage of sales
Research and development in nanotechnology	541713	318,659	92	139,497	86	179,162	97
Research and development in biotechnology (except nanobiotechnology)	541714	424,684	155	212,223	126	212,461	184
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	811,455	104	406,056	87	405,399	120
Social sciences and humanities research and development	541720	11,031	109	4,113	70	6,918	132

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error &gt; 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 that performed or funded R&D.

**Source(s):**

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

TABLE 12

**Domestic R&D performed by the company, by state and employment size, for companies with 1–9 employees: 2018**

(Number of companies and thousands of U.S. dollars)

State	All companies		1–4 employees		5–9 employees	
	Companies (number)	Amount	Companies (number)	Amount	Companies (number)	Amount
All states	12,541	4,526,838	7,545	1,890,728	4,997	2,636,110
Alabama	89	27,715	D	D	D	D
Alaska	D	D	D	D	D	D
Arizona	241	83,639	121	20,760	118	62,879
Arkansas	62	18,212	D	D	D	D
California	3,405	1,506,256	1,853	453,196	1,551	1,053,060
Colorado	401	106,763	327	64,383	73	42,380
Connecticut	119	44,829	73	23,798	45	21,030
Delaware	96	48,667	69	24,376	D	D
District of Columbia	36	8,648	D	D	D	D
Florida	649	150,234	466	107,406	184	42,828
Georgia	437	123,209	259	68,783	179	54,426
Hawaii	D	D	D	D	D	D
Idaho	53	14,089	D	D	D	D
Illinois	347	112,326	235	70,686	113	41,639
Indiana	68	30,283	43	15,714	D	D
Iowa	46	11,383	D	D	D	D
Kansas	47	16,029	31	6,789	D	D
Kentucky	127	33,781	100	26,115	D	D
Louisiana	24	6,581	D	D	D	D
Maine	D	D	D	D	D	D
Maryland	340	132,147	232	66,752	110	65,395
Massachusetts	548	356,022	309	161,539	240	194,483
Michigan	279	88,106	163	53,733	117	34,374
Minnesota	213	50,762	120	26,734	92	24,028
Mississippi	19	3,905	D	D	D	D
Missouri	120	36,821	67	18,229	D	D
Montana	D	D	D	D	D	D
Nebraska	48	12,892	D	D	D	D
Nevada	91	27,720	63	9,625	29	18,095
New Hampshire	80	35,638	D	D	D	D
New Jersey	232	62,644	131	27,549	99	35,094
New Mexico	71	23,945	24	4,078	48	19,868
New York	523	154,737	369	84,091	152	70,646
North Carolina	382	106,708	277	50,856	105	55,852
North Dakota	D	D	D	D	D	D
Ohio	201	57,088	160	40,652	42	16,436
Oklahoma	39	17,412	29	6,840	D	D
Oregon	199	63,553	104	19,256	96	44,297
Pennsylvania	378	157,350	217	71,745	162	85,606
Rhode Island	D	D	D	D	D	D
South Carolina	61	26,743	38	9,934	D	D
South Dakota	31	9,195	D	D	D	D
Tennessee	84	19,054	72	17,026	D	D
Texas	957	265,339	493	99,009	464	166,330
Utah	124	41,705	47	7,668	76	34,037
Vermont	33	10,559	D	D	D	D
Virginia	271	82,654	189	30,418	83	52,236

TABLE 12

**Domestic R&D performed by the company, by state and employment size, for companies with 1–9 employees: 2018**

(Number of companies and thousands of U.S. dollars)

State	All companies		1–4 employees		5–9 employees	
	Companies (number)	Amount	Companies (number)	Amount	Companies (number)	Amount
Washington	582	221,251	340	67,453	243	153,798
West Virginia	D	D	D	D	D	D
Wisconsin	133	41,172	70	17,756	62	23,416
Wyoming	D	D	D	D	D	D
Undistributed	D	D	D	D	D	D

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

**Note(s):**

Detail may not add to total because of rounding. Statistics are representative of companies located in the United States that performed or funded R&amp;D.

**Source(s):**

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

TABLE 13

**Domestic R&D performed by the company, by state and source of funds, for companies with 1–9 employees: 2018**

(Thousands of U.S. dollars)

State	Total	Paid for by the company	Foreign owner	Another U.S. company	Other businesses outside the United States	U.S. university or college	U.S. nonprofit organization	U.S. federal government	U.S. state or local government	All other organizations outside the United States
All states	4,526,838	3,570,660	175,207	196,003	34,019	10,459	13,871	506,856	17,078	D
Alabama	27,715	24,475	0	D	0	0	0	D	D	0
Alaska	D	D	0	0	0	0	0	0	0	0
Arizona	83,639	68,365	D	D	0	0	0	D	0	0
Arkansas	18,212	7,017	0	D	0	0	D	D	D	0
California	1,506,256	1,241,805	63,471	30,614	D	D	D	151,389	D	D
Colorado	106,763	91,874	D	D	0	D	0	12,309	D	D
Connecticut	44,829	32,802	0	D	D	0	0	D	D	D
Delaware	48,667	42,758	D	D	D	0	D	D	0	D
District of Columbia	8,648	7,272	0	D	D	0	D	D	0	0
Florida	150,234	116,050	D	D	D	0	0	D	D	0
Georgia	123,209	111,879	0	D	0	D	D	D	0	0
Hawaii	D	D	0	0	D	0	0	D	D	0
Idaho	14,089	13,375	0	D	0	0	0	D	0	0
Illinois	112,326	92,241	0	D	0	0	D	10,805	0	0
Indiana	30,283	24,908	D	D	0	D	0	D	0	0
Iowa	11,383	D	0	D	0	0	0	D	D	0
Kansas	16,029	11,111	0	D	0	D	D	D	0	0
Kentucky	33,781	26,680	0	D	0	D	0	D	D	0
Louisiana	6,581	5,000	0	D	0	0	0	D	0	0
Maine	D	D	0	0	0	0	0	0	0	0
Maryland	132,147	95,036	D	D	D	D	0	28,269	D	0
Massachusetts	356,022	262,746	D	14,167	D	D	D	38,112	D	D
Michigan	88,106	78,243	0	D	D	D	D	7,157	D	0
Minnesota	50,762	46,625	D	D	0	D	D	D	0	0
Mississippi	3,905	D	0	D	0	0	0	D	0	0
Missouri	36,821	28,715	D	D	0	0	0	D	0	0
Montana	D	D	D	0	0	0	0	D	D	0
Nebraska	12,892	D	0	0	0	D	0	D	D	0
Nevada	27,720	16,066	0	D	D	0	0	D	0	0
New Hampshire	35,638	14,516	0	D	D	0	0	D	0	0
New Jersey	62,644	51,635	D	D	D	D	0	D	0	D
New Mexico	23,945	15,991	0	D	0	0	D	D	0	0
New York	154,737	107,332	D	D	D	D	0	35,155	D	0
North Carolina	106,708	86,708	D	D	D	D	D	12,994	D	0
North Dakota	D	D	0	D	D	D	0	D	0	0
Ohio	57,088	32,478	D	D	0	D	D	11,543	D	0
Oklahoma	17,412	16,829	0	D	0	D	D	D	0	0
Oregon	63,553	53,336	0	D	D	0	0	D	D	0
Pennsylvania	157,350	128,045	D	D	D	D	D	24,072	D	0
Rhode Island	D	D	0	0	0	0	0	0	0	0
South Carolina	26,743	23,038	0	D	0	0	0	D	D	D
South Dakota	9,195	9,195	0	0	0	0	0	0	0	0
Tennessee	19,054	17,952	0	D	0	0	0	D	0	0
Texas	265,339	232,449	D	D	D	D	0	21,143	D	0

TABLE 13

**Domestic R&D performed by the company, by state and source of funds, for companies with 1–9 employees: 2018**

(Thousands of U.S. dollars)

State	Total	Paid for by the company	Foreign owner	Another U.S. company	Other businesses outside the United States	U.S. university or college	U.S. nonprofit organization	U.S. federal government	U.S. state or local government	All other organizations outside the United States
Utah	41,705 r	12,304	0	D	0	0	0	D	0	0
Vermont	10,559	6,662	0	D	0	0	0	D	0	0
Virginia	82,654	55,984	0	8,256	D	D	0	14,280	0	0
Washington	221,251	140,261	D	D	D	D	0	26,547	D	D
West Virginia	D	D	0	0	0	0	0	D	0	0
Wisconsin	41,172	32,437	0	D	0	0	0	7,857	D	0
Wyoming	D	D	0	0	0	0	0	D	0	0
Undistributed	D	D	0	0	0	0	0	0	0	0

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

**Note(s):**

Detail may not add to total because of rounding. Statistics are representative of companies located in the United States that performed or funded R&amp;D.

**Source(s):**

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

TABLE 14

**R&D employees, by selected industry and employment size, for companies with 1–9 employees: 2018**

(Number)

Industry	NAICS code	All companies	1–4 employees	5–9 employees
All selected industries	31–33, 42, 51, 5413, 5415, 5417	30,951	12,834	18,118
Manufacturing industries	31–33	4,306	1,757	2,550
Food, beverage, and tobacco products	311–12	D	D	0
Textile, apparel, and leather products	313–16	13	D	D
Wood products	321	0	0	0
Paper	322	0	0	0
Printing and related support activities	323	D	D	0
Petroleum and coal products	324	D	0	D
Chemicals	325	602	259	343
Pharmaceuticals and medicines	3254	357	137	219
Chemicals, excluding pharmaceuticals	other 325	245	121	124
Plastics and rubber products	326	0	0	0
Nonmetallic mineral products	327	66 r	D	D
Primary metals	331	0	0	0
Fabricated metal products	332	47 r	D	D
Machinery	333	462	333 r	129
Computer and electronic products	334	2,330	678	1,652
Semiconductor and other electronic components	3344	535	162	372
Navigational, measuring, electromedical, and control instruments	3345	1,247	344	903
Other computer and electronic products	other 334	549	172	377
Electrical equipment, appliances, and components	335	291	179	112
Transportation equipment	336	110	57	53
Aerospace products and parts	3364	97	51	46
Other transportation equipment	other 336	D	D	D
Furniture and related products	337	0	0	0
Miscellaneous manufacturing	339	348	181	167
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	26,645	11,077	15,568
Wholesale trade	42	1,198	233	965
Information	51	4,576	1,536	3,041
Software publishers	5112	3,321	1,088	2,233
Information, excluding software publishers	51 less 5112	1,255	447	808
Architectural, engineering, and related services	5413	2,472	1,279	1,192
Computer systems design and related services	5415	9,658	4,400	5,259
Scientific research and development services	5417	8,741	3,630	5,111
Research and development in nanotechnology	541713	1,705	712	993
Research and development in biotechnology (except nanobiotechnology)	541714	2,475	1,020	1,455
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	4,359	1,838	2,520
Social sciences and humanities research and development	541720	97	31	66

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

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. Statistics are representative of companies located in the United States that performed or funded R&amp;D.

**Source(s):**

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

TABLE 15

**R&D employees, by selected industry and sex, for companies with 1–9 employees: 2018**

(Number)

Industry	NAICS code	Total	Male	Female
All selected industries	31–33, 42, 51, 5413, 5415, 5417	30,951	24,353	6,598
Manufacturing industries	31–33	4,306	3,718	589
Food, beverage, and tobacco products	311–12	D	D	0
Textile, apparel, and leather products	313–16	13	10	D
Wood products	321	0	0	0
Paper	322	0	0	0
Printing and related support activities	323	D	D	0
Petroleum and coal products	324	D	D	D
Chemicals	325	602	407	195
Pharmaceuticals and medicines	3254	357	233	124
Chemicals, excluding pharmaceuticals	other 325	245	174	72
Plastics and rubber products	326	0	0	0
Nonmetallic mineral products	327	66 r	51 r	16 r
Primary metals	331	0	0	0
Fabricated metal products	332	47 r	36 r	D
Machinery	333	462	410	D
Computer and electronic products	334	2,330	2,093	237
Semiconductor and other electronic components	3344	535	481	53
Navigational, measuring, electromedical, and control instruments	3345	1,247	1,096	150
Other computer and electronic products	other 334	549	515	34
Electrical equipment, appliances, and components	335	291	276	14
Transportation equipment	336	110	100	10
Aerospace products and parts	3364	97	87	10
Other transportation equipment	other 336	D	D	0
Furniture and related products	337	0	0	0
Miscellaneous manufacturing	339	348	301	47
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	26,645	20,636	6,010
Wholesale trade	42	1,198	813	385
Information	51	4,576	3,913	663
Software publishers	5112	3,321	2,853	468
Information, excluding software publishers	51, excluding 5112	1,255	1,061	195
Architectural, engineering, and related services	5413	2,472	1,995	476
Computer systems design and related services	5415	9,658	7,928	1,730
Scientific research and development services	5417	8,741	5,986	2,755
Research and development in nanotechnology	541713	1,705	1,273	432
Research and development in biotechnology (except nanobiotechnology)	541714	2,475	1,534	941
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	4,359	3,042	1,317
Social sciences and humanities research and development	541720	97	70	28

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. Statistics are representative of companies located in the United States that performed or funded R&D.

**Source(s):**

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

TABLE 16

**Domestic R&D employees, by selected industry, R&D occupation, and education, for companies with 1–9 employees: 2018**

(Number)

Industry	NAICS code	All R&D employees		Researchers (including R&D scientists, engineers, and their managers)		Researchers with PhD (excluding MD, JD, and EdD)		R&D technicians and equivalent staff		R&D support staff (clerical and other)	
All selected industries	31–33, 42, 51, 5413, 5415, 5417	30,951		21,526		6,454		6,954		2,471	
Manufacturing industries	31–33	4,306		3,179		922		832		295	
Food, beverage, and tobacco products	311–12	D		D		D		0		0	
Textile, apparel, and leather products	313–16	13		10		0		D		0	
Wood products	321	0		0		0		0		0	
Paper	322	0		0		0		0		0	
Printing and related support activities	323	D		D		D		0		0	
Petroleum and coal products	324	D		D		0		D		0	
Chemicals	325	602		390		212		148		64	
Pharmaceuticals and medicines	3254	357		242		148		90		25	
Chemicals, excluding pharmaceuticals	other 325	245		148		64		58		39	
Plastics and rubber products	326	0		0		0		0		0	
Nonmetallic mineral products	327	66 r		D		D		D		D	
Primary metals	331	0		0		0		0		0	
Fabricated metal products	332	47 r		D		0		D		D	
Machinery	333	462		452		233 r		9		0	
Computer and electronic products	334	2,330		1,727		355		477		126	
Semiconductor and other electronic components	3344	535		397		98		126		11	
Navigational, measuring, electromedical, and control instruments	3345	1,247		1,001		225		176		69 r	
Other computer and electronic products	other 334	549		329		32		175		45	
Electrical equipment, appliances, and components	335	291		233		34 r		39		19	
Transportation equipment	336	110		84		12 r		15		11 r	
Aerospace products and parts	3364	97		71		D		15		11 r	
Other transportation equipment	other 336	D		D		D		0		0	
Furniture and related products	337	0		0		0		0		0	
Miscellaneous manufacturing	339	348		212		58		88		49	
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	26,645		18,347		5,532		6,122		2,176	
Wholesale trade	42	1,198		469		185		429		299	
Information	51	4,576		2,966		394		1,108		502	
Software publishers	5112	3,321		2,251		270		770		300	
Information, excluding software publishers	51, excluding 5112	1,255		716		124		338		202	
Architectural, engineering, and related services	5413	2,472		1,828		314		527		117	
Computer systems design and related services	5415	9,658		6,414		726		2,515		730	
Scientific research and development services	5417	8,741		6,670		3,913		1,543		528	
Research and development in nanotechnology	541713	1,705		1,356		722		251		98	
Research and development in biotechnology (except nanobiotechnology)	541714	2,475		1,809		1,257		483		183	
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	4,359		3,367		1,852		764		228	
Social sciences and humanities research and development	541720	97		68		47		24		D	



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. Statistics are representative of companies located in the United States that performed or funded R&D. The Researchers with PhD category is a subset of the Researchers category.

**Source(s):**

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

TABLE 17

**Domestic full-time equivalent R&D employees, by selected industry and occupation, for companies with 1–9 employees: 2018**

(Number)

Industry	NAICS code	R&D employees —full-time equivalent	Researchers —full-time equivalent
All selected industries	31–33, 42, 51, 5413, 5415, 5417	26,259	18,842
Manufacturing industries	31–33	3,610	2,784
Food, beverage, and tobacco products	311–12	D	D
Textile, apparel, and leather products	313–16	10	10
Wood products	321	0	0
Paper	322	0	0
Printing and related support activities	323	D	D
Petroleum and coal products	324	D	D
Chemicals	325	491	342
Pharmaceuticals and medicines	3254	297	212
Chemicals, excluding pharmaceuticals	other 325	195	130
Plastics and rubber products	326	0	0
Nonmetallic mineral products	327	65 r	D
Primary metals	331	0	0
Fabricated metal products	332	45 r	D
Machinery	333	406	395
Computer and electronic products	334	1,955	1,513
Semiconductor and other electronic components	3344	438	338
Navigational, measuring, electromedical, and control instruments	3345	1,045	893
Other computer and electronic products	other 334	472	282
Electrical equipment, appliances, and components	335	239	205
Transportation equipment	336	86	65
Aerospace products and parts	3364	73	52
Other transportation equipment	other 336	D	D
Furniture and related products	337	0	0
Miscellaneous manufacturing	339	286	192
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	22,649	16,057
Wholesale trade	42	1,086	442
Information	51	3,964	2,582
Software publishers	5112	2,921	1,947
Information, excluding software publishers	51, excluding 5112	1,043	635
Architectural, engineering, and related services	5413	2,100	1,539
Computer systems design and related services	5415	7,921	5,514
Scientific research and development services	5417	7,579	5,981
Research and development in nanotechnology	541713	1,452	1,210
Research and development in biotechnology (except nanobiotechnology)	541714	2,210	1,681
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	3,737	2,962
Social sciences and humanities research and development	541720	82	58

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

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. Statistics are representative of companies located in the United States that performed or funded R&amp;D.

**Source(s):**

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

TABLE 18-1

**Tax credit for research activities for companies with R&D expenditures and 1–9 employees, by industry: 2018**

(Number and percent)

Industry	NAICS code	Total	Yes, filed Form 6765 in 2018	No, did not file Form 6765 in 2018
All selected industries	31–33, 42, 51, 5413, 5415, 5417	12,975	21.7	77.9
Manufacturing industries	31–33	1,889	23.1	76.7
Food, beverage, and tobacco products	311–12	D	0.0	D
Textile, apparel, and leather products	313–16	10	D	D
Wood products	321	0	0.0	0.0
Paper	322	0	0.0	0.0
Printing and related support activities	323	D	D	0.0
Petroleum and coal products	324	D	D	D
Chemicals	325	274	29.2	71.2
Pharmaceuticals and medicines	3254	165	34.5	66.1
Chemicals, excluding pharmaceuticals	other 325	110	20.0	78.2
Plastics and rubber products	326	0	0.0	0.0
Nonmetallic mineral products	327	15	r	D
Primary metals	331	0	0.0	0.0
Fabricated metal products	332	18	r	100.0
Machinery	333	135	20.7	r
Computer and electronic products	334	998	23.8	76.3
Semiconductor and other electronic components	3344	201	14.9	84.1
Navigational, measuring, electromedical, and control instruments	3345	533	29.5	70.4
Other computer and electronic products	other 334	266	19.2	81.2
Electrical equipment, appliances, and components	335	173	9.8	90.2
Transportation equipment	336	41	41.5	r
Aerospace products and parts	3364	33	33.3	r
Other transportation equipment	other 336	D	D	D
Furniture and related products	337	0	0.0	0.0
Miscellaneous manufacturing	339	212	17.5	80.7
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	11,085	21.5	78.2
Wholesale trade	42	505	16.2	r
Information	51	1,801	20.0	79.3
Software publishers	5112	1,268	20.1	79.6
Information, excluding software publishers	51, excluding 5112	534	19.5	78.8
Architectural, engineering, and related services	5413	1,256	19.1	80.8
Computer systems design and related services	5415	4,639	19.7	79.9
Scientific research and development services	5417	2,883	27.2	72.6
Research and development in nanotechnology	541713	572	24.8	74.8
Research and development in biotechnology (except nanobiotechnology)	541714	838	35.2	64.7
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	1,408	24.2	75.6
Social sciences and humanities research and development	541720	32	D	93.8

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error &gt; 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 that performed or funded R&D.

**Source(s):**

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

TABLE 18-2

**Tax credit for research activities for companies with R&D expenditures and 1–4 employees, by industry: 2018**

(Number and percent)

Industry	NAICS code	Total	Yes, filed Form 6765 in 2018	No, did not file Form 6765 in 2018
All selected industries	31–33, 42, 51, 5413, 5415, 5417	7,843	20.2	79.4
Manufacturing industries	31–33	1,006	18.6	81.1
Food, beverage, and tobacco products	311–12	D	0.0	D
Textile, apparel, and leather products	313–16	D	D	D
Wood products	321	0	0.0	0.0
Paper	322	0	0.0	0.0
Printing and related support activities	323	D	D	0.0
Petroleum and coal products	324	0	0.0	0.0
Chemicals	325	136	22.8	77.9
Pharmaceuticals and medicines	3254	83	27.7	r 73.5
Chemicals, excluding pharmaceuticals	other 325	54	16.7	85.2
Plastics and rubber products	326	0	0.0	0.0
Nonmetallic mineral products	327	D	0.0	D
Primary metals	331	0	0.0	0.0
Fabricated metal products	332	D	0.0	D
Machinery	333	103	r 0.0	100.0
Computer and electronic products	334	436	23.2	77.1
Semiconductor and other electronic components	3344	81	19.8	81.5
Navigational, measuring, electromedical, and control instruments	3345	245	28.6	71.4
Other computer and electronic products	other 334	111	15.3	r 85.6
Electrical equipment, appliances, and components	335	112	D	96.4
Transportation equipment	336	26	57.7	r 46.2
Aerospace products and parts	3364	20	D	60.0
Other transportation equipment	other 336	D	D	0.0
Furniture and related products	337	0	0.0	0.0
Miscellaneous manufacturing	339	162	18.5	79.0
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	6,836	20.5	79.2
Wholesale trade	42	185	28.1	r 71.9
Information	51	908	17.2	81.3
Software publishers	5112	612	20.4	78.8
Information, excluding software publishers	51, excluding 5112	296	10.1	86.1
Architectural, engineering, and related services	5413	888	15.9	84.2
Computer systems design and related services	5415	3,013	19.8	80.0
Scientific research and development services	5417	1,840	24.6	75.2
Research and development in nanotechnology	541713	350	22.3	77.7
Research and development in biotechnology (except nanobiotechnology)	541714	535	31.4	68.4
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	919	22.5	77.3
Social sciences and humanities research and development	541720	18	0.0	100.0

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error &gt; 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 that performed or funded R&D.

**Source(s):**

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

TABLE 18-3

**Tax credit for research activities for companies with R&D expenditures and 5–9 employees, by industry: 2018**

(Number and percent)

Industry	NAICS code	Total	Yes, filed Form 6765 in 2018	No, did not file Form 6765 in 2018
All selected industries	31–33, 42, 51, 5413, 5415, 5417	5,133	24.0	75.6
Manufacturing industries	31–33	884	28.5	71.6
Food, beverage, and tobacco products	311–12	0	0.0	0.0
Textile, apparel, and leather products	313–16	D	0.0	D
Wood products	321	0	0.0	0.0
Paper	322	0	0.0	0.0
Printing and related support activities	323	0	0.0	0.0
Petroleum and coal products	324	D	D	D
Chemicals	325	139	36.0	64.7
Pharmaceuticals and medicines	3254	83	42.2	59.0
Chemicals, excluding pharmaceuticals	other 325	55	27.3	74.5
Plastics and rubber products	326	0	0.0	0.0
Nonmetallic mineral products	327	D	D	D
Primary metals	331	0	0.0	0.0
Fabricated metal products	332	D	0.0	D
Machinery	333	32	87.5	D
Computer and electronic products	334	564	24.5	75.5
Semiconductor and other electronic components	3344	121	12.4	r 86.0
Navigational, measuring, electromedical, and control instruments	3345	286	30.8	69.6
Other computer and electronic products	other 334	157	22.3	r 78.3
Electrical equipment, appliances, and components	335	62	19.4	79.0
Transportation equipment	336	14	D	78.6
Aerospace products and parts	3364	12	D	75.0
Other transportation equipment	other 336	D	0.0	D
Furniture and related products	337	0	0.0	0.0
Miscellaneous manufacturing	339	51	13.7	88.2
Selected nonmanufacturing industries	42, 51, 5413, 5415, 5417	4,248	23.1	76.5
Wholesale trade	42	320	9.4	90.6
Information	51	894	22.8	77.1
Software publishers	5112	656	20.0	80.2
Information, excluding software publishers	51, excluding 5112	237	31.2	69.6
Architectural, engineering, and related services	5413	369	27.1	72.6
Computer systems design and related services	5415	1,625	19.5	79.7
Scientific research and development services	5417	1,042	31.8	67.9
Research and development in nanotechnology	541713	223	29.1	70.4
Research and development in biotechnology (except nanobiotechnology)	541714	302	41.7	57.9
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	488	27.7	72.3
Social sciences and humanities research and development	541720	12	D	91.7

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error &gt; 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 that performed or funded R&D.

**Source(s):**

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

TABLE 19

**Product innovating companies, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Product innovation			
			Number		Percent	
			Yes	No	Yes	No
All industries	11, 21–23, 31–33, 42–81	4,805,151	919,293	3,885,858	19.1	80.9
Manufacturing industries	31–33	217,565	46,960	170,605	21.6	78.4
Food	311	18,250	4,123	14,127	22.6	77.4
Beverage and tobacco products	312	7,723	2,303	5,420	29.8	70.2
Textile, apparel, and leather products	313–16	10,554	2,210	8,344	20.9	79.1
Wood products	321	11,012	1,608	9,404	14.6	85.4
Paper	322	2,117	466	1,651	22.0	78.0
Printing and related support activities	323	20,851	4,190	16,661	20.1	79.9
Petroleum and coal products	324	583	77	506	13.2	86.8
Chemicals	325	7,522	2,010	5,512	26.7	73.3
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	141	452	23.8	76.2
Pharmaceuticals and medicines	3254	1,365	478	887	35.0	65.0
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	458	1,178	28.0	72.0
Other chemicals	other 325	3,927	933	2,994	23.8	76.2
Plastics and rubber products	326	8,087	2,181	5,906	27.0	73.0
Nonmetallic mineral products	327	7,749	1,394	6,355	18.0	82.0
Primary metals	331	2,537	351	2,186	13.8	86.2
Fabricated metal products	332	48,472	7,348	41,124	15.2	84.8
Machinery	333	18,558	5,008	13,550	27.0	73.0
Computer and electronic products	334	9,036	3,310	5,726	36.6	63.4
Communications equipment	3342	974	421	553	43.2	56.8
Semiconductor and other electronic components	3344	2,796	816	1,980	29.2	70.8
Navigational, measuring, electromedical, and control instruments	3345	3,909	1,582	2,327	40.5	59.5
Other computer and electronic products	other 334	1,359	492	867	36.2	63.8
Electrical equipment, appliances, and components	335	4,000	1,195	2,805	29.9	70.1
Transportation equipment	336	7,175	1,609	5,566	22.4	77.6
Automobiles, bodies, trailers, and parts	3361–63	4,565	1,019	3,546	22.3	77.7
Aerospace products and parts	3364	985	252	733	25.6	74.4
Other transportation	other 336	1,625	337	1,288	20.7	79.3
Furniture and related products	337	12,647	2,120	10,527	16.8	83.2
Miscellaneous	339	20,669	5,451	15,218	26.4	73.6
Medical equipment and supplies	3391	8,060	2,145	5,915	26.6	73.4
Other miscellaneous manufacturing	3399	12,608	3,306	9,302	26.2	73.8
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	872,334	3,715,252	19.0	81.0
Agriculture, forestry, fishing, and hunting	11	21,606	2,620	18,986	12.1	87.9
Mining, extraction, and support activities	21	14,969	1,615	13,354	10.8	89.2
Utilities	22	2,684	389	2,295	14.5	85.5
Construction	23	613,110	73,745	539,365	12.0	88.0
Wholesale trade	42	257,153	55,446	201,707	21.6	78.4
Retail trade	44–45	560,952	103,248	457,704	18.4	81.6
Transportation and warehousing	48–49	152,463	21,184	131,279	13.9	86.1
Information	51	61,638	17,920	43,718	29.1	70.9
Publishing	511	17,590	5,681	11,909	32.3	67.7
Newspaper, periodical, book, and directory publishers	5111	9,761	2,236	7,525	22.9	77.1
Software publishers	5112	7,828	3,444	4,384	44.0	56.0

TABLE 19

**Product innovating companies, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Product innovation			
			Number		Percent	
			Yes	No	Yes	No
Telecommunications	517	7,164	1,837	5,327	25.6	74.4
Data processing, hosting, and related services	518	8,918	3,133	5,785	35.1	64.9
Other information	other 51	27,965	7,270	20,695	26.0	74.0
Finance and insurance	52	200,857	55,631	145,226	27.7	72.3
Real estate and rental and leasing	53	255,783	43,762	212,021	17.1	82.9
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	353	1,459	19.5	80.5
Other real estate and rental and leasing	other 53	253,970	43,410	210,560	17.1	82.9
Professional, scientific, and technical services	54	695,672	172,128	523,544	24.7	75.3
Legal services	5411	152,243	24,608	127,635	16.2	83.8
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	22,979	83,655	21.5	78.5
Architectural, engineering, and related services	5413	88,491	21,800	66,691	24.6	75.4
Specialized design services	5414	26,282	5,258	21,024	20.0	80.0
Computer systems design and related services	5415	95,950	34,804	61,146	36.3	63.7
Management, scientific, and technical consulting services	5416	132,989	40,186	92,803	30.2	69.8
Scientific research and development services	5417	9,798	2,915	6,883	29.8	70.2
Advertising, public relations, and related services	5418	27,677	7,376	20,301	26.7	73.3
Other professional, scientific, and technical services	5419	55,569	12,200	43,369	22.0	78.0
Management of companies and enterprises	55	2,409	316	2,093	13.1	86.9
Administrative and support and waste management and remediation services	56	287,807	53,159	234,648	18.5	81.5
Educational services	61	53,912	16,493	37,419	30.6	69.4
Health care and social assistance	62	519,556	106,618	412,938	20.5	79.5
Health care services	621–23	459,855	91,272	368,583	19.8	80.2
Social assistance	624	59,700	15,345	44,355	25.7	74.3
Arts, entertainment, and recreation	71	88,831	19,099	69,732	21.5	78.5
Accommodation and food services	72	453,059	71,355	381,704	15.7	84.3
Other services	81	345,125	57,605	287,520	16.7	83.3

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.

TABLE 20

**Product innovating companies, by size of company: 2016–18**

(Number and percent)

Employment size	Companies (number)	Product innovation			
		Number		Percent	
		Yes	No	Yes	No
All companies	4,805,151	919,293	3,885,858	19.1	80.9
Micro companies					
1–4	2,667,724	516,326	2,151,398	19.4	80.6
5–9	936,576	184,195	752,381	19.7	80.3
Small companies					
10–19	579,513	109,963	469,550	19.0	81.0
20–49	402,199	69,307	332,892	17.2	82.8
Medium companies					
50–99	119,497	21,481	98,016	18.0	82.0
100–249	65,565	11,177	54,388	17.0	83.0
Large companies					
250–499	18,897	3,467	15,430	18.3	81.7
500–999	7,289	1,442	5,847	19.8	80.2
1,000–4,999	6,199	1,401	4,798	22.6	77.4
5,000–9,999	823	248	575	30.1	69.9
10,000–24,999	514	175	339	34.0	66.0
25,000 or more	358	113	245	31.6	68.4

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding or unavailable the 2017 North American Industry Classification System 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.



TABLE 21

**Product innovating companies, by firm classification of sex: 2016–18**

(Number and percent)

Sex of owners	Companies (number)	Product innovation			
		Number		Percent	
		Yes	No	Yes	No
All companies (sex of owner)	4,805,151	919,293	3,885,858	19.1	80.9
Female majority owned	987,899	203,269	784,630	20.6	79.4
Male majority owned	3,028,739	572,538	2,456,201	18.9	81.1
Equally owned by male and female	745,304	136,036	609,268	18.3	81.7
Unclassifiable	43,211	7,453	35,758	17.2	82.8

**Note(s):**

Detail may not add to total because of rounding.

**Source(s):**

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

TABLE 22

**Product innovating companies, by firm classification of race and ethnicity: 2016–18**

(Number and percent)

Race and ethnicity of owners	Companies (number)	Product innovation			
		Number		Percent	
		Yes	No	Yes	No
All companies (race and ethnicity)	4,805,151	919,293	3,885,858	19.1	80.9
Race					
White	4,170,180	763,495	3,406,685	18.3	81.7
Asian	473,828	123,950	349,878	26.2	73.8
Black or African American	94,492	20,210	74,282	21.4	78.6
American Indian or Alaska Native	21,567	4,070	17,497	18.9	81.1
Native Hawaiian or Other Pacific Islander	5,446	928	4,518	17.0	83.0
Ethnicity					
Hispanic or Latino	271,545	60,494	211,051	22.3	77.7
Equally Hispanic and not Hispanic	41,138	9,249	31,889	22.5	77.5
Not Hispanic	4,449,259	842,098	3,607,161	18.9	81.1
Minority status					
Minority	853,539	206,018	647,521	24.1	75.9
Black or African American, American Indian or Alaska Native, or Hispanic or Latino	376,112	81,614	294,498	21.7	78.3
Equally minority and nonminority	71,956	15,955	56,001	22.2	77.8
Nonminority	3,836,446	689,871	3,146,575	18.0	82.0
Unclassifiable	43,211	7,453	35,758	17.2	82.8

**Note(s):**

Detail may not add to total because of rounding. Companies may be included in one or more race and ethnicity category. Companies classified as "minority" are those companies classified as any race and ethnicity combination other than not Hispanic and White. 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.

TABLE 23

**Product innovating companies, by state: 2016–18**

(Number and percent)

State	Companies (number)	Product innovation			
		Number		Percent	
		Yes	No	Yes	No
All states	4,805,151	919,293	3,885,858	19.1	80.9
Alabama	55,146	8,424	46,722	15.3	84.7
Alaska	12,297	2,704	9,593	22.0	78.0
Arizona	82,414	17,077	65,337	20.7	79.3
Arkansas	39,656	6,377	33,279	16.1	83.9
California	594,609	130,248	464,361	21.9	78.1
Colorado	116,495	24,191	92,304	20.8	79.2
Connecticut	53,726	9,432	44,294	17.6	82.4
Delaware	14,472	2,947	11,525	20.4	79.6
District of Columbia	7,748	1,667	6,081	21.5	78.5
Florida	353,892	72,103	281,789	20.4	79.6
Georgia	135,369	25,934	109,435	19.2	80.8
Hawaii	18,391	3,602	14,789	19.6	80.4
Idaho	33,993	5,977	28,016	17.6	82.4
Illinois	201,013	39,144	161,869	19.5	80.5
Indiana	89,129	15,946	73,183	17.9	82.1
Iowa	52,742	7,524	45,218	14.3	85.7
Kansas	46,476	8,188	38,288	17.6	82.4
Kentucky	53,421	10,201	43,220	19.1	80.9
Louisiana	58,237	10,436	47,801	17.9	82.1
Maine	24,943	3,880	21,063	15.6	84.4
Maryland	83,878	16,294	67,584	19.4	80.6
Massachusetts	102,125	18,684	83,441	18.3	81.7
Michigan	140,485	23,296	117,189	16.6	83.4
Minnesota	98,880	18,948	79,932	19.2	80.8
Mississippi	31,804	5,499	26,305	17.3	82.7
Missouri	86,368	16,186	70,182	18.7	81.3
Montana	27,636	4,008	23,628	14.5	85.5
Nebraska	37,855	6,474	31,381	17.1	82.9
Nevada	37,738	7,512	30,226	19.9	80.1
New Hampshire	23,942	3,646	20,296	15.2	84.8
New Jersey	143,259	27,265	115,994	19.0	81.0
New Mexico	24,530	4,829	19,701	19.7	80.3
New York	318,382	65,311	253,071	20.5	79.5
North Carolina	146,412	24,719	121,693	16.9	83.1
North Dakota	15,827	2,651	13,176	16.7	83.3
Ohio	148,853	28,030	120,823	18.8	81.2
Oklahoma	55,458	9,591	45,867	17.3	82.7
Oregon	78,566	14,297	64,269	18.2	81.8
Pennsylvania	183,297	33,758	149,539	18.4	81.6
Rhode Island	16,775	2,928	13,847	17.5	82.5
South Carolina	63,398	11,706	51,692	18.5	81.5
South Dakota	18,018	2,533	15,485	14.1	85.9
Tennessee	71,803	12,133	59,670	16.9	83.1
Texas	323,126	65,921	257,205	20.4	79.6
Utah	54,544	10,776	43,768	19.8	80.2
Vermont	13,776	2,223	11,553	16.1	83.9
Virginia	120,855	23,903	96,952	19.8	80.2

TABLE 23

**Product innovating companies, by state: 2016–18**

(Number and percent)

State	Companies (number)	Product innovation			
		Number		Percent	
		Yes	No	Yes	No
Washington	121,736	21,844	99,892	17.9	82.1
West Virginia	20,066	3,404	16,662	17.0	83.0
Wisconsin	95,652	14,299	81,353	14.9	85.1
Wyoming	13,264	2,067	11,197	15.6	84.4
Undistributed	42,675	8,563	34,112	20.1	79.9

**Note(s):**

Detail may not add to total because of rounding.

**Source(s):**

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

TABLE 24

**Goods innovating companies, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Goods innovation			
			Number		Percent	
			Yes	No	Yes	No
All industries	11, 21–23, 31–33, 42–81	4,805,151	357,206	4,447,946	7.4	92.6
Manufacturing industries	31–33	217,565	40,686	176,880	18.7	81.3
Food	311	18,250	3,685	14,566	20.2	79.8
Beverage and tobacco products	312	7,723	2,093	5,629	27.1	72.9
Textile, apparel, and leather products	313–16	10,554	1,729	8,824	16.4	83.6
Wood products	321	11,012	1,415	9,596	12.8	87.1
Paper	322	2,117	399	1,719	18.8	81.2
Printing and related support activities	323	20,851	2,998	17,854	14.4	85.6
Petroleum and coal products	324	583	60	522	10.3	89.5
Chemicals	325	7,522	1,845	5,676	24.5	75.5
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	131	464	22.1	78.2
Pharmaceuticals and medicines	3254	1,365	423	943	31.0	69.1
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	442	1,193	27.0	72.9
Other chemicals	other 325	3,927	850	3,078	21.6	78.4
Plastics and rubber products	326	8,087	2,067	6,019	25.6	74.4
Nonmetallic mineral products	327	7,749	1,109	6,639	14.3	85.7
Primary metals	331	2,537	309	2,229	12.2	87.9
Fabricated metal products	332	48,472	5,754	42,719	11.9	88.1
Machinery	333	18,558	4,771	13,788	25.7	74.3
Computer and electronic products	334	9,036	3,007	6,030	33.3	66.7
Communications equipment	3342	974	408	565	41.9	58.0
Semiconductor and other electronic components	3344	2,796	729	2,069	26.1	74.0
Navigational, measuring, electromedical, and control instruments	3345	3,909	1,461	2,449	37.4	62.7
Other computer and electronic products	other 334	1,359	411	947	30.2	69.7
Electrical equipment, appliances, and components	335	4,000	1,155	2,845	28.9	71.1
Transportation equipment	336	7,175	1,460	5,716	20.3	79.7
Automobiles, bodies, trailers, and parts	3361–63	4,565	981	3,583	21.5	78.5
Aerospace products and parts	3364	985	195	789	19.8	80.1
Other transportation	other 336	1,625	282	1,342	17.4	82.6
Furniture and related products	337	12,647	1,981	10,666	15.7	84.3
Miscellaneous	339	20,669	4,842	15,828	23.4	76.6
Medical equipment and supplies	3391	8,060	1,923	6,138	23.9	76.2
Other miscellaneous manufacturing	3399	12,608	2,918	9,689	23.1	76.8
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	316,521	4,271,065	6.9	93.1
Agriculture, forestry, fishing, and hunting	11	21,606	934	20,673	4.3	95.7
Mining, extraction, and support activities	21	14,969	492	14,476	3.3	96.7
Utilities	22	2,684	125	2,559	4.7	95.3
Construction	23	613,110	28,156	584,953	4.6	95.4
Wholesale trade	42	257,153	46,330	210,822	18.0	82.0
Retail trade	44–45	560,952	84,603	476,350	15.1	84.9
Transportation and warehousing	48–49	152,463	4,957	147,506	3.3	96.7
Information	51	61,638	7,302	54,337	11.8	88.2
Publishing	511	17,590	3,168	14,424	18.0	82.0
Newspaper, periodical, book, and directory publishers	5111	9,761	991	8,769	10.2	89.8
Software publishers	5112	7,828	2,176	5,653	27.8	72.2

TABLE 24

**Goods innovating companies, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Goods innovation			
			Number		Percent	
			Yes	No	Yes	No
Telecommunications	517	7,164	1,036	6,129	14.5	85.6
Data processing, hosting, and related services	518	8,918	1,041	7,879	11.7	88.3
Other information	other 51	27,965	2,061	25,905	7.4	92.6
Finance and insurance	52	200,857	3,177	197,681	1.6	98.4
Real estate and rental and leasing	53	255,783	5,399	250,384	2.1	97.9
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	D	1,754	D	96.8
Other real estate and rental and leasing	other 53	253,970	5,341	248,629	2.1	97.9
Professional, scientific, and technical services	54	695,672	30,377	665,294	4.4	95.6
Legal services	5411	152,243	437	151,808	0.3	99.7
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	757	105,878	0.7	99.3
Architectural, engineering, and related services	5413	88,491	3,882	84,608	4.4	95.6
Specialized design services	5414	26,282	1,879	24,405	7.1	92.9
Computer systems design and related services	5415	95,950	9,889	86,062	10.3	89.7
Management, scientific, and technical consulting services	5416	132,989	6,125	126,864	4.6	95.4
Scientific research and development services	5417	9,798	1,695	8,104	17.3	82.7
Advertising, public relations, and related services	5418	27,677	1,395	26,281	5.0	95.0
Other professional, scientific, and technical services	5419	55,569	4,323	51,248	7.8	92.2
Management of companies and enterprises	55	2,409	163	2,247	6.8	93.3
Administrative and support and waste management and remediation services	56	287,807	10,755	277,053	3.7	96.3
Educational services	61	53,912	2,941	50,970	5.5	94.5
Health care and social assistance	62	519,556	18,364	501,193	3.5	96.5
Health care services	621–23	459,855	16,545	443,311	3.6	96.4
Social assistance	624	59,700	1,818	57,881	3.0	97.0
Arts, entertainment, and recreation	71	88,831	4,961	83,871	5.6	94.4
Accommodation and food services	72	453,059	46,167	406,890	10.2	89.8
Other services	81	345,125	21,322	323,802	6.2	93.8

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals.

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.

TABLE 25

**Goods innovating companies, by size of company: 2016–18**

(Number and percent)

Employment size	Companies (number)	Goods innovation			
		Number		Percent	
		Yes	No	Yes	No
All companies	4,805,151	357,206	4,447,946	7.4	92.6
Micro companies					
1–4	2,667,724	171,676	2,496,050	6.4	93.6
5–9	936,576	79,964	856,612	8.5	91.5
Small companies					
10–19	579,513	52,282	527,230	9.0	91.0
20–49	402,199	33,077	369,121	8.2	91.8
Medium companies					
50–99	119,497	10,933	108,565	9.1	90.9
100–249	65,565	5,636	59,930	8.6	91.4
Large companies					
250–499	18,897	1,749	17,147	9.3	90.7
500–999	7,289	847	6,440	11.6	88.4
1,000–4,999	6,199	692	5,508	11.2	88.9
5,000–9,999	823	173	649	21.0	78.9
10,000–24,999	514	110	406	21.4	79.0
25,000 or more	358	74	285	20.7	79.6

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding or unavailable 2017 North American Industry Classification System 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.

TABLE 26

## Services innovating companies, by industry: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	Services innovation			
			Number		Percent	
			Yes	No	Yes	No
All industries	11, 21–23, 31–33, 42–81	4,805,151	723,571	4,081,580	15.1	84.9
Manufacturing industries	31–33	217,565	17,236	200,329	7.9	92.1
Food	311	18,250	1,047	17,203	5.7	94.3
Beverage and tobacco products	312	7,723	719	7,004	9.3	90.7
Textile, apparel, and leather products	313–16	10,554	869	9,685	8.2	91.8
Wood products	321	11,012	566	10,446	5.1	94.9
Paper	322	2,117	86 r	2,031	4.1 r	95.9
Printing and related support activities	323	20,851	2,728	18,123	13.1	86.9
Petroleum and coal products	324	583	31 r	552	5.3 r	94.7
Chemicals	325	7,522	529	6,993	7.0	93.0
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	74 r	519	12.5 r	87.5
Pharmaceuticals and medicines	3254	1,365	126	1,239	9.2	90.8
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	70	1,566	4.3	95.7
Other chemicals	other 325	3,927	257	3,670	6.5	93.5
Plastics and rubber products	326	8,087	341	7,746	4.2	95.8
Nonmetallic mineral products	327	7,749	571	7,178	7.4	92.6
Primary metals	331	2,537	77	2,460	3.0	97.0
Fabricated metal products	332	48,472	3,309	45,163	6.8	93.2
Machinery	333	18,558	1,467	17,091	7.9	92.1
Computer and electronic products	334	9,036	983	8,053	10.9	89.1
Communications equipment	3342	974	124	850	12.7	87.3
Semiconductor and other electronic components	3344	2,796	201	2,595	7.2	92.8
Navigational, measuring, electromedical, and control instruments	3345	3,909	464	3,445	11.9	88.1
Other computer and electronic products	other 334	1,359	196	1,163	14.4	85.6
Electrical equipment, appliances, and components	335	4,000	314	3,686	7.9	92.2
Transportation equipment	336	7,175	452	6,723	6.3	93.7
Automobiles, bodies, trailers, and parts	3361–63	4,565	241	4,324	5.3	94.7
Aerospace products and parts	3364	985	101	884	10.3	89.7
Other transportation	other 336	1,625	109	1,516	6.7	93.3
Furniture and related products	337	12,647	662	11,985	5.2	94.8
Miscellaneous	339	20,669	2,488	18,181	12.0	88.0
Medical equipment and supplies	3391	8,060	1,007	7,053	12.5	87.5
Other miscellaneous manufacturing	3399	12,608	1,483	11,125	11.8	88.2
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	706,335	3,881,251	15.4	84.6
Agriculture, forestry, fishing, and hunting	11	21,606	2,021	19,585	9.4	90.6
Mining, extraction, and support activities	21	14,969	1,202	13,767	8.0	92.0
Utilities	22	2,684	313	2,371	11.7	88.3
Construction	23	613,110	61,973	551,137	10.1	89.9
Wholesale trade	42	257,153	21,719	235,434	8.4	91.6
Retail trade	44–45	560,952	49,196	511,756	8.8	91.2
Transportation and warehousing	48–49	152,463	18,939	133,524	12.4	87.6
Information	51	61,638	14,732	46,906	23.9	76.1
Publishing	511	17,590	4,006	13,584	22.8	77.2
Newspaper, periodical, book, and directory publishers	5111	9,761	1,699	8,062	17.4	82.6
Software publishers	5112	7,828	2,308	5,520	29.5	70.5



TABLE 26

**Services innovating companies, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Services innovation			
			Number		Percent	
			Yes	No	Yes	No
Telecommunications	517	7,164	1,566	5,598	21.9	78.1
Data processing, hosting, and related services	518	8,918	2,707	6,211	30.4	69.6
Other information	other 51	27,965	6,452	21,513	23.1	76.9
Finance and insurance	52	200,857	54,746	146,111	27.3	72.7
Real estate and rental and leasing	53	255,783	41,171	214,612	16.1	83.9
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	294	1,518	16.2	r 83.8
Other real estate and rental and leasing	other 53	253,970	40,877	213,093	16.1	83.9
Professional, scientific, and technical services	54	695,672	160,817	534,855	23.1	76.9
Legal services	5411	152,243	24,434	127,809	16.0	84.0
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	22,690	83,944	21.3	78.7
Architectural, engineering, and related services	5413	88,491	20,170	68,321	22.8	77.2
Specialized design services	5414	26,282	4,381	21,901	16.7	83.3
Computer systems design and related services	5415	95,950	31,411	64,539	32.7	67.3
Management, scientific, and technical consulting services	5416	132,989	38,342	94,647	28.8	71.2
Scientific research and development services	5417	9,798	1,932	7,866	19.7	80.3
Advertising, public relations, and related services	5418	27,677	6,770	20,907	24.5	75.5
Other professional, scientific, and technical services	5419	55,569	10,685	44,884	19.2	80.8
Management of companies and enterprises	55	2,409	214	2,195	8.9	91.1
Administrative and support and waste management and remediation services	56	287,807	49,736	238,071	17.3	82.7
Educational services	61	53,912	15,720	38,192	29.2	70.8
Health care and social assistance	62	519,556	101,828	417,728	19.6	80.4
Health care services	621–23	459,855	87,200	372,655	19.0	81.0
Social assistance	624	59,700	14,628	45,072	24.5	75.5
Arts, entertainment, and recreation	71	88,831	16,973	71,858	19.1	80.9
Accommodation and food services	72	453,059	42,967	410,092	9.5	90.5
Other services	81	345,125	52,066	293,059	15.1	84.9

r = relative standard error &gt; 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.

TABLE 27

**Services innovating companies, by size of company: 2016–18**

(Number and percent)

Employment size	Companies (number)	Services innovation			
		Number		Percent	
		Yes	No	Yes	No
All companies	4,805,151	723,571	4,081,580	15.1	84.9
Micro companies					
1–4	2,667,724	423,064	2,244,660	15.9	84.1
5–9	936,576	144,338	792,238	15.4	84.6
Small companies					
10–19	579,513	80,725	498,788	13.9	86.1
20–49	402,199	49,375	352,824	12.3	87.7
Medium companies					
50–99	119,497	14,326	105,171	12.0	88.0
100–249	65,565	7,528	58,037	11.5	88.5
Large companies					
250–499	18,897	2,021	16,876	10.7	89.3
500–999	7,289	938	6,351	12.9	87.1
1,000–4,999	6,199	911	5,288	14.7	r 85.3
5,000–9,999	823	136	687	16.5	83.5
10,000–24,999	514	116	398	22.6	77.4
25,000 or more	358	91	267	25.4	74.6 r

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding or unavailable 2017 North American Industry Classification System 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.

TABLE 28

**Business process innovating companies, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Business process innovation			
			Number		Percent	
			Yes	No	Yes	No
All industries	11, 21–23, 31–33, 42–81	4,805,151	929,754	3,875,397	19.3	80.7
Manufacturing industries	31–33	217,565	57,775	159,790	26.6	73.4
Food	311	18,250	5,396	12,854	29.6	70.4
Beverage and tobacco products	312	7,723	2,624	5,099	34.0	66.0
Textile, apparel, and leather products	313–16	10,554	2,451	8,103	23.2	76.8
Wood products	321	11,012	2,102	8,910	19.1	80.9
Paper	322	2,117	631	1,486	29.8	70.2
Printing and related support activities	323	20,851	4,814	16,037	23.1	76.9
Petroleum and coal products	324	583	163	420	28.0	72.0
Chemicals	325	7,522	2,459	5,063	32.7	67.3
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	200	393	33.7	66.3
Pharmaceuticals and medicines	3254	1,365	536	829	39.3	60.7
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	531	1,105	32.5	67.5
Other chemicals	other 325	3,927	1,193	2,734	30.4	69.6
Plastics and rubber products	326	8,087	2,554	5,533	31.6	68.4
Nonmetallic mineral products	327	7,749	1,634	6,115	21.1	78.9
Primary metals	331	2,537	699	1,838	27.6	72.4
Fabricated metal products	332	48,472	11,797	36,675	24.3	75.7
Machinery	333	18,558	5,821	12,737	31.4	68.6
Computer and electronic products	334	9,036	2,902	6,134	32.1	67.9
Communications equipment	3342	974	370	604	38.0	62.0
Semiconductor and other electronic components	3344	2,796	990	1,806	35.4	64.6
Navigational, measuring, electromedical, and control instruments	3345	3,909	1,177	2,732	30.1	69.9
Other computer and electronic products	other 334	1,359	367	992	27.0	73.0
Electrical equipment, appliances, and components	335	4,000	1,222	2,778	30.6	69.5
Transportation equipment	336	7,175	1,793	5,382	25.0	75.0
Automobiles, bodies, trailers, and parts	3361–63	4,565	1,107	3,458	24.2	75.8
Aerospace products and parts	3364	985	264	721	26.8	73.2
Other transportation	other 336	1,625	424	1,201	26.1	73.9
Furniture and related products	337	12,647	2,867	9,780	22.7	77.3
Miscellaneous	339	20,669	5,835	14,834	28.2	71.8
Medical equipment and supplies	3391	8,060	2,449	5,611	30.4	69.6
Other miscellaneous manufacturing	3399	12,608	3,387	9,221	26.9	73.1
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	871,980	3,715,606	19.0	81.0
Agriculture, forestry, fishing, and hunting	11	21,606	2,812	18,794	13.0	87.0
Mining, extraction, and support activities	21	14,969	1,323	13,646	8.8	91.2
Utilities	22	2,684	437	2,247	16.3	83.7
Construction	23	613,110	84,810	528,300	13.8	86.2
Wholesale trade	42	257,153	61,477	195,676	23.9	76.1
Retail trade	44–45	560,952	115,299	445,653	20.6	79.4
Transportation and warehousing	48–49	152,463	32,288	120,175	21.2	78.8
Information	51	61,638	17,517	44,121	28.4	71.6
Publishing	511	17,590	5,632	11,958	32.0	68.0
Newspaper, periodical, book, and directory publishers	5111	9,761	2,154	7,607	22.1	77.9
Software publishers	5112	7,828	3,477	4,351	44.4	55.6

TABLE 28

**Business process innovating companies, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Business process innovation			
			Number		Percent	
			Yes	No	Yes	No
Telecommunications	517	7,164	1,984	5,180	27.7	72.3
Data processing, hosting, and related services	518	8,918	3,256	5,662	36.5	63.5
Other information	other 51	27,965	6,646	21,319	23.8	76.2
Finance and insurance	52	200,857	39,923	160,934	19.9	80.1
Real estate and rental and leasing	53	255,783	38,262	217,521	15.0	85.0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	257	1,555	14.2	85.8
Other real estate and rental and leasing	other 53	253,970	38,004	215,966	15.0	85.0
Professional, scientific, and technical services	54	695,672	150,463	545,209	21.6	78.4
Legal services	5411	152,243	18,535	133,708	12.2	87.8
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	17,647	88,987	16.5	83.5
Architectural, engineering, and related services	5413	88,491	17,819	70,672	20.1	79.9
Specialized design services	5414	26,282	5,774	20,508	22.0	78.0
Computer systems design and related services	5415	95,950	33,191	62,759	34.6	65.4
Management, scientific, and technical consulting services	5416	132,989	34,721	98,268	26.1	73.9
Scientific research and development services	5417	9,798	2,974	6,824	30.4	69.6
Advertising, public relations, and related services	5418	27,677	7,126	20,551	25.7	74.3
Other professional, scientific, and technical services	5419	55,569	12,678	42,891	22.8	77.2
Management of companies and enterprises	55	2,409	414	1,995	17.2	82.8
Administrative and support and waste management and remediation services	56	287,807	53,717	234,090	18.7	81.3
Educational services	61	53,912	14,568	39,344	27.0	73.0
Health care and social assistance	62	519,556	96,291	423,265	18.5	81.5
Health care services	621–23	459,855	83,166	376,689	18.1	81.9
Social assistance	624	59,700	13,124	46,576	22.0	78.0
Arts, entertainment, and recreation	71	88,831	14,559	74,272	16.4	83.6
Accommodation and food services	72	453,059	91,077	361,982	20.1	79.9
Other services	81	345,125	56,736	288,389	16.4	83.6

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 29

**Business process innovating companies, by size of company: 2016–18**

(Number and percent)

Employment size	Companies (number)	Business process innovation			
		Number		Percent	
		Yes	No	Yes	No
All companies	4,805,151	929,754	3,875,397	19.3	80.7
Micro companies					
1–4	2,667,724	440,470	2,227,254	16.5	83.5
5–9	936,576	203,963	732,613	21.8	78.2
Small companies					
10–19	579,513	132,998	446,515	22.9	77.1
20–49	402,199	96,530	305,669	24.0	76.0
Medium companies					
50–99	119,497	30,046	89,451	25.1	74.9
100–249	65,565	16,611	48,954	25.3	74.7
Large companies					
250–499	18,897	4,778	14,119	25.3	74.7
500–999	7,289	1,907	5,382	26.2	73.8
1,000–4,999	6,199	1,855	4,344	29.9	70.1
5,000–9,999	823	276	547	33.5	66.5
10,000–24,999	514	187	327	36.4	63.6
25,000 or more	358	136	222	38.0	62.0

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 30

**Business process innovating companies, by firm classification of sex: 2016–18**

(Number and percent)

Sex of owners	Companies (number)	Business process innovation			
		Number		Percent	
		Yes	No	Yes	No
All companies (sex of owner)	4,805,151	929,754	3,875,397	19.3	80.7
Female majority owned	987,899	204,862	783,037	20.7	79.3
Male majority owned	3,028,739	570,424	2,458,315	18.8	81.2
Equally owned by male and female	745,304	144,061	601,243	19.3	80.7
Unclassifiable	43,211	10,407	32,804	24.1	75.9

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 31

**Business process innovating companies, by firm classification of race and ethnicity: 2016–18**

(Number and percent)

Race and ethnicity of owners	Companies (number)	Business process innovation			
		Number		Percent	
		Yes	No	Yes	No
All companies (race and ethnicity)	4,805,151	929,754	3,875,397	19.3	80.7
Race					
White	4,170,180	776,165	3,394,015	18.6	81.4
Asian	473,828	116,019	357,809	24.5	75.5
Black or African American	94,492	22,331	72,161	23.6	76.4
American Indian or Alaska Native	21,567	4,978	16,589	23.1	76.9
Native Hawaiian or Other Pacific Islander	5,446	891	4,555	16.4	83.6
Ethnicity					
Hispanic or Latino	271,545	69,613	201,932	25.6	74.4
Equally Hispanic and not Hispanic	41,138	8,961	32,177	21.8	78.2
Not Hispanic	4,449,259	840,777	3,608,482	18.9	81.1
Minority status					
Minority	853,539	209,605	643,934	24.6	75.4
Black or African American, American Indian or Alaska Native, or Hispanic or Latino	376,112	93,243	282,869	24.8	75.2
Equally minority and nonminority	71,956	16,021	55,935	22.3	77.7
Nonminority	3,836,446	693,722	3,142,724	18.1	81.9
Unclassifiable	43,211	10,407	32,804	24.1	75.9

**Note(s):**

Detail may not add to total because of rounding. Companies may be included in one or more race and ethnicity category. Companies classified as "minority" are those companies classified as any race and ethnicity combination other than not Hispanic and White. 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.

TABLE 32

**Business process innovating companies, by state: 2016–18**

(Number and percent)

State	Companies (number)	Business process innovation			
		Number		Percent	
		Yes	No	Yes	No
All states	4,805,151	929,754	3,875,397	19.3	80.7
Alabama	55,146	8,770	46,376	15.9	84.1
Alaska	12,297	2,220	10,077	18.1	81.9
Arizona	82,414	16,034	66,380	19.5	80.5
Arkansas	39,656	5,723	33,933	14.4	85.6
California	594,609	130,276	464,333	21.9	78.1
Colorado	116,495	23,522	92,973	20.2	79.8
Connecticut	53,726	10,698	43,028	19.9	80.1
Delaware	14,472	2,857	11,615	19.7	80.3
District of Columbia	7,748	1,889	5,859	24.4	75.6
Florida	353,892	71,735	282,157	20.3	79.7
Georgia	135,369	26,038	109,331	19.2	80.8
Hawaii	18,391	3,134	15,257	17.0	83.0
Idaho	33,993	5,810	28,183	17.1	82.9
Illinois	201,013	39,714	161,299	19.8	80.2
Indiana	89,129	17,566	71,563	19.7	80.3
Iowa	52,742	8,233	44,509	15.6	84.4
Kansas	46,476	7,386	39,090	15.9	84.1
Kentucky	53,421	8,432	44,989	15.8	84.2
Louisiana	58,237	8,175	50,062	14.0	86.0
Maine	24,943	4,803	20,140	19.3	80.7
Maryland	83,878	16,489	67,389	19.7	80.3
Massachusetts	102,125	19,243	82,882	18.8	81.2
Michigan	140,485	26,029	114,456	18.5	81.5
Minnesota	98,880	19,421	79,459	19.6	80.4
Mississippi	31,804	5,223	26,581	16.4	83.6
Missouri	86,368	15,513	70,855	18.0	82.0
Montana	27,636	4,618	23,018	16.7	83.3
Nebraska	37,855	6,455	31,400	17.1	82.9
Nevada	37,738	7,265	30,473	19.3	80.7
New Hampshire	23,942	4,019	19,923	16.8	83.2
New Jersey	143,259	28,814	114,445	20.1	79.9
New Mexico	24,530	4,561	19,969	18.6	81.4
New York	318,382	62,975	255,407	19.8	80.2
North Carolina	146,412	25,512	120,900	17.4	82.6
North Dakota	15,827	1,854	13,973	11.7	88.3
Ohio	148,853	30,522	118,331	20.5	79.5
Oklahoma	55,458	7,886	47,572	14.2	85.8
Oregon	78,566	17,433	61,133	22.2	77.8
Pennsylvania	183,297	34,106	149,191	18.6	81.4
Rhode Island	16,775	3,470	13,305	20.7	79.3
South Carolina	63,398	11,638	51,760	18.4	81.6
South Dakota	18,018	3,116	14,902	17.3	82.7
Tennessee	71,803	12,444	59,359	17.3	82.7
Texas	323,126	64,821	258,305	20.1	79.9
Utah	54,544	11,136	43,408	20.4	79.6
Vermont	13,776	2,605	11,171	18.9	81.1
Virginia	120,855	22,631	98,224	18.7	81.3



TABLE 32

**Business process innovating companies, by state: 2016–18**

(Number and percent)

State	Companies (number)	Business process innovation			
		Number		Percent	
		Yes	No	Yes	No
Washington	121,736	24,434	97,302	20.1	79.9
West Virginia	20,066	2,235	17,831	11.1	88.9
Wisconsin	95,652	17,314	78,338	18.1	81.9
Wyoming	13,264	2,326	10,938	17.5	82.5
Undistributed	42,675	10,642	32,033	24.9	75.1

**Note(s):**

Detail may not add to total because of rounding.

**Source(s):**

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

TABLE 33

**Companies with new or improved business processes: Methods for producing goods or providing services, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovating methods for producing goods or providing services			
			Number		Percent	
			Yes	No	Yes	No
All industries	11, 21–23, 31–33, 42–81	4,805,151	350,030	4,455,121	7.3	92.7
Manufacturing industries	31–33	217,565	33,828	183,737	15.5	84.5
Food	311	18,250	2,874	15,376	15.7	84.3
Beverage and tobacco products	312	7,723	1,400	6,323	18.1	81.9
Textile, apparel, and leather products	313–16	10,554	1,265	9,289	12.0	88.0
Wood products	321	11,012	1,138	9,874	10.3	89.7
Paper	322	2,117	301	1,816	14.2	85.8
Printing and related support activities	323	20,851	3,162	17,689	15.2	84.8
Petroleum and coal products	324	583	69	514	11.8	88.2
Chemicals	325	7,522	1,445	6,077	19.2	80.8
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	71	522	12.0	88.0
Pharmaceuticals and medicines	3254	1,365	301	1,064	22.1	77.9
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	345	1,291	21.1	78.9
Other chemicals	other 325	3,927	729	3,198	18.6	81.4
Plastics and rubber products	326	8,087	1,454	6,633	18.0	82.0
Nonmetallic mineral products	327	7,749	746	7,003	9.6	90.4
Primary metals	331	2,537	279	2,258	11.0	89.0
Fabricated metal products	332	48,472	6,949	41,523	14.3	85.7
Machinery	333	18,558	3,391	15,167	18.3	81.7
Computer and electronic products	334	9,036	1,588	7,448	17.6	82.4
Communications equipment	3342	974	181	793	18.6	81.4
Semiconductor and other electronic components	3344	2,796	635	2,161	22.7	77.3
Navigational, measuring, electromedical, and control instruments	3345	3,909	629	3,280	16.1	83.9
Other computer and electronic products	other 334	1,359	144	1,215	10.6	89.4
Electrical equipment, appliances, and components	335	4,000	748	3,252	18.7	81.3
Transportation equipment	336	7,175	1,139	6,036	15.9	84.1
Automobiles, bodies, trailers, and parts	3361–63	4,565	712	3,853	15.6	84.4
Aerospace products and parts	3364	985	193	792	19.6	80.4
Other transportation	other 336	1,625	236	1,389	14.5	85.5
Furniture and related products	337	12,647	1,914	10,733	15.1	84.9
Miscellaneous	339	20,669	3,970	16,699	19.2	80.8
Medical equipment and supplies	3391	8,060	1,878	6,182	23.3	76.7
Other miscellaneous manufacturing	3399	12,608	2,092	10,516	16.6	83.4
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	316,203	4,271,383	6.9	93.1
Agriculture, forestry, fishing, and hunting	11	21,606	1,556	20,050	7.2	92.8
Mining, extraction, and support activities	21	14,969	660	14,309	4.4	95.6
Utilities	22	2,684	132	2,552	4.9	95.1
Construction	23	613,110	33,065	580,045	5.4	94.6
Wholesale trade	42	257,153	21,645	235,508	8.4	91.6
Retail trade	44–45	560,952	35,881	525,071	6.4	93.6
Transportation and warehousing	48–49	152,463	7,439	145,024	4.9	95.1
Information	51	61,638	7,018	54,620	11.4	88.6
Publishing	511	17,590	2,270	15,320	12.9	87.1
Newspaper, periodical, book, and directory publishers	5111	9,761	709	9,052	7.3	92.7

TABLE 33

**Companies with new or improved business processes: Methods for producing goods or providing services, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovating methods for producing goods or providing services			
			Number		Percent	
			Yes	No	Yes	No
Software publishers	5112	7,828	1,560	6,268	19.9	80.1
Telecommunications	517	7,164	708	6,456	9.9	90.1
Data processing, hosting, and related services	518	8,918	1,273	7,645	14.3	85.7
Other information	other 51	27,965	2,768	25,197	9.9	90.1
Finance and insurance	52	200,857	12,903	187,954	6.4	93.6
Real estate and rental and leasing	53	255,783	9,697	246,086	3.8	96.2
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	D	1,754	D	96.8
Other real estate and rental and leasing	other 53	253,970	9,639	244,331	3.8	96.2
Professional, scientific, and technical services	54	695,672	57,247	638,425	8.2	91.8
Legal services	5411	152,243	5,546	146,697	3.6	96.4
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	5,091	101,543	4.8	95.2
Architectural, engineering, and related services	5413	88,491	8,242	80,249	9.3	90.7
Specialized design services	5414	26,282	2,029	24,253	7.7	92.3
Computer systems design and related services	5415	95,950	13,634	82,316	14.2	85.8
Management, scientific, and technical consulting services	5416	132,989	13,687	119,302	10.3	89.7
Scientific research and development services	5417	9,798	1,936	7,862	19.8	80.2
Advertising, public relations, and related services	5418	27,677	2,532	25,145	9.1	90.9
Other professional, scientific, and technical services	5419	55,569	4,548	51,021	8.2	91.8
Management of companies and enterprises	55	2,409	46 r	2,363	1.9 r	98.1
Administrative and support and waste management and remediation services	56	287,807	20,576	267,231	7.1	92.9
Educational services	61	53,912	5,636	48,276	10.5	89.5
Health care and social assistance	62	519,556	35,331	484,225	6.8	93.2
Health care services	621–23	459,855	30,143	429,712	6.6	93.4
Social assistance	624	59,700	5,187	54,513	8.7	91.3
Arts, entertainment, and recreation	71	88,831	4,771	84,060	5.4	94.6
Accommodation and food services	72	453,059	38,069	414,990	8.4	91.6
Other services	81	345,125	24,528	320,597	7.1	92.9

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

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 34

**Companies with new or improved business processes: Methods for producing goods or providing services, by size of company: 2016–18**

(Number and percent)

Employment size	Companies (number)	Innovating methods for producing goods or providing services			
		Number		Percent	
		Yes	No	Yes	No
All companies	4,805,151	350,030	4,455,121	7.3	92.7
Micro companies					
1–4	2,667,724	167,798	2,499,926	6.3	93.7
5–9	936,576	80,404	856,172	8.6	91.4
Small companies					
10–19	579,513	48,756	530,757	8.4	91.6
20–49	402,199	33,254	368,945	8.3	91.7
Medium companies					
50–99	119,497	10,549	108,948	8.8	91.2
100–249	65,565	5,699	59,866	8.7	91.3
Large companies					
250–499	18,897	1,905	16,992	10.1	89.9
500–999	7,289	644	6,645	8.8	91.2
1,000–4,999	6,199	721	5,478	11.6	88.4
5,000–9,999	823	130	693	15.8	84.2
10,000–24,999	514	98	416	19.1	80.9
25,000 or more	358	69	289	19.3	80.7

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 35

**Companies with new or improved business processes: Logistics, delivery, or distribution methods, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovating logistics, delivery, or distribution methods			
			Number		Percent	
			Yes	No	Yes	No
All industries	11, 21–23, 31–33, 42–81	4,805,151	239,756	4,565,395	5.0	95.0
Manufacturing industries	31–33	217,565	14,489	203,076	6.7	93.3
Food	311	18,250	1,733	16,517	9.5	90.5
Beverage and tobacco products	312	7,723	991	6,732	12.8	87.2
Textile, apparel, and leather products	313–16	10,554	560	9,994	5.3	94.7
Wood products	321	11,012	602	10,410	5.5	94.5
Paper	322	2,117	126	1,991	6.0	94.0
Printing and related support activities	323	20,851	1,256	19,595	6.0	94.0
Petroleum and coal products	324	583	55	528	9.4	90.6
Chemicals	325	7,522	793	6,729	10.5	89.5
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	47	546	7.9	92.1
Pharmaceuticals and medicines	3254	1,365	121	1,244	8.9	91.1
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	258	1,378	15.8	84.2
Other chemicals	other 325	3,927	369	3,558	9.4	90.6
Plastics and rubber products	326	8,087	492	7,595	6.1	93.9
Nonmetallic mineral products	327	7,749	488	7,261	6.3	93.7
Primary metals	331	2,537	164	2,373	6.5	93.5
Fabricated metal products	332	48,472	2,598	45,874	5.4	94.6
Machinery	333	18,558	1,114	17,444	6.0	94.0
Computer and electronic products	334	9,036	478	8,558	5.3	94.7
Communications equipment	3342	974	94	880	9.7	90.3
Semiconductor and other electronic components	3344	2,796	130	2,666	4.6	95.4
Navigational, measuring, electromedical, and control instruments	3345	3,909	212	3,697	5.4	94.6
Other computer and electronic products	other 334	1,359	42	1,317	3.1	96.9
Electrical equipment, appliances, and components	335	4,000	293	3,707	7.3	92.7
Transportation equipment	336	7,175	394	6,781	5.5	94.5
Automobiles, bodies, trailers, and parts	3361–63	4,565	180	4,385	3.9	96.1
Aerospace products and parts	3364	985	60	925	6.1	93.9
Other transportation	other 336	1,625	153	1,472	9.4	90.6
Furniture and related products	337	12,647	757	11,890	6.0	94.0
Miscellaneous	339	20,669	1,590	19,079	7.7	92.3
Medical equipment and supplies	3391	8,060	655	7,405	8.1	91.9
Other miscellaneous manufacturing	3399	12,608	936	11,672	7.4	92.6
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	225,266	4,362,320	4.9	95.1
Agriculture, forestry, fishing, and hunting	11	21,606	624	20,982	2.9	97.1
Mining, extraction, and support activities	21	14,969	210	14,759	1.4	98.6
Utilities	22	2,684	74	2,610	2.8	97.2
Construction	23	613,110	17,847	595,263	2.9	97.1
Wholesale trade	42	257,153	22,702	234,451	8.8	91.2
Retail trade	44–45	560,952	32,118	528,834	5.7	94.3
Transportation and warehousing	48–49	152,463	21,628	130,835	14.2	85.8
Information	51	61,638	4,994	56,644	8.1	91.9
Publishing	511	17,590	1,721	15,869	9.8	90.2
Newspaper, periodical, book, and directory publishers	5111	9,761	823	8,938	8.4	91.6

TABLE 35

**Companies with new or improved business processes: Logistics, delivery, or distribution methods, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovating logistics, delivery, or distribution methods			
			Number		Percent	
			Yes	No	Yes	No
Software publishers	5112	7,828	897	6,931	11.5	88.5
Telecommunications	517	7,164	653	6,511	9.1	90.9
Data processing, hosting, and related services	518	8,918	545	8,373	6.1	93.9
Other information	other 51	27,965	2,076	25,889	7.4	92.6
Finance and insurance	52	200,857	9,542	191,315	4.8	95.2
Real estate and rental and leasing	53	255,783	5,659	250,124	2.2	97.8
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	102 r	1,710	5.6 r	94.4
Other real estate and rental and leasing	other 53	253,970	5,556	248,414	2.2	97.8
Professional, scientific, and technical services	54	695,672	31,668	664,004	4.6	95.4
Legal services	5411	152,243	2,750	149,493	1.8	98.2
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	4,311	102,323	4.0	96.0
Architectural, engineering, and related services	5413	88,491	3,876	84,615	4.4	95.6
Specialized design services	5414	26,282	1,147	25,135	4.4	95.6
Computer systems design and related services	5415	95,950	6,966	88,984	7.3	92.7
Management, scientific, and technical consulting services	5416	132,989	7,587	125,402	5.7	94.3
Scientific research and development services	5417	9,798	476	9,322	4.9	95.1
Advertising, public relations, and related services	5418	27,677	1,572	26,105	5.7	94.3
Other professional, scientific, and technical services	5419	55,569	2,982	52,587	5.4	94.6
Management of companies and enterprises	55	2,409	D	2,408	D	100.0
Administrative and support and waste management and remediation services	56	287,807	14,256	273,551	5.0	95.0
Educational services	61	53,912	2,932	50,980	5.4	94.6
Health care and social assistance	62	519,556	17,414	502,142	3.4	96.6
Health care services	621–23	459,855	15,488	444,367	3.4	96.6
Social assistance	624	59,700	1,924	57,776	3.2	96.8
Arts, entertainment, and recreation	71	88,831	2,092	86,739	2.4	97.6
Accommodation and food services	72	453,059	30,038	423,021	6.6	93.4
Other services	81	345,125	11,460	333,665	3.3	96.7

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

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 36

**Companies with new or improved business processes: Logistics, delivery, or distribution methods, by size of company: 2016–18**

(Number and percent)

Employment size	Companies (number)	Innovating logistics, delivery, or distribution methods			
		Number		Percent	
		Yes	No	Yes	No
All companies	4,805,151	239,756	4,565,395	5.0	95.0
Micro companies					
1–4	2,667,724	112,301	2,555,423	4.2	95.8
5–9	936,576	53,654	882,922	5.7	94.3
Small companies					
10–19	579,513	33,330	546,183	5.8	94.2
20–49	402,199	25,551	376,648	6.4	93.6
Medium companies					
50–99	119,497	7,718	111,779	6.5	93.5
100–249	65,565	4,510	61,055	6.9	93.1
Large companies					
250–499	18,897	1,292	17,605	6.8	93.2
500–999	7,289	514	6,775	7.1	92.9
1,000–4,999	6,199	624	5,575	10.1 r	89.9
5,000–9,999	823	95	728	11.5	88.5
10,000–24,999	514	90	424	17.5	82.5
25,000 or more	358	76	282	21.2	78.8 r

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 37

**Companies with new or improved business processes: Marketing methods, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovating marketing methods			
			Number		Percent	
			Yes	No	Yes	No
All industries	11, 21–23, 31–33, 42–81	4,805,151	469,731	4,335,420	9.8	90.2
Manufacturing industries	31–33	217,565	26,927	190,638	12.4	87.6
Food	311	18,250	3,316	14,934	18.2	81.8
Beverage and tobacco products	312	7,723	1,735	5,988	22.5	77.5
Textile, apparel, and leather products	313–16	10,554	1,326	9,228	12.6	87.4
Wood products	321	11,012	884	10,128	8.0	92.0
Paper	322	2,117	336	1,781	15.9	84.1
Printing and related support activities	323	20,851	2,315	18,536	11.1	88.9
Petroleum and coal products	324	583	48	535	8.2	91.8
Chemicals	325	7,522	1,297	6,225	17.2	82.8
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	112	481	18.9	81.1
Pharmaceuticals and medicines	3254	1,365	252	1,113	18.5	81.5
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	378	1,258	23.1	76.9
Other chemicals	other 325	3,927	557	3,370	14.2	85.8
Plastics and rubber products	326	8,087	1,108	6,979	13.7	86.3
Nonmetallic mineral products	327	7,749	765	6,984	9.9	90.1
Primary metals	331	2,537	146	2,391	5.8	94.2
Fabricated metal products	332	48,472	4,195	44,277	8.7	91.3
Machinery	333	18,558	2,573	15,985	13.9	86.1
Computer and electronic products	334	9,036	1,178	7,858	13.0	87.0
Communications equipment	3342	974	183	791	18.8	81.2
Semiconductor and other electronic components	3344	2,796	367	2,429	13.1	86.9
Navigational, measuring, electromedical, and control instruments	3345	3,909	472	3,437	12.1	87.9
Other computer and electronic products	other 334	1,359	156	1,203	11.5	88.5
Electrical equipment, appliances, and components	335	4,000	551	3,449	13.8	86.2
Transportation equipment	336	7,175	752	6,423	10.5	89.5
Automobiles, bodies, trailers, and parts	3361–63	4,565	433	4,132	9.5	90.5
Aerospace products and parts	3364	985	101	884	10.3	89.7
Other transportation	other 336	1,625	220	1,405	13.5	86.5
Furniture and related products	337	12,647	1,474	11,173	11.7	88.3
Miscellaneous	339	20,669	2,917	17,752	14.1	85.9
Medical equipment and supplies	3391	8,060	1,059	7,001	13.1	86.9
Other miscellaneous manufacturing	3399	12,608	1,859	10,749	14.7	85.3
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	442,805	4,144,781	9.7	90.3
Agriculture, forestry, fishing, and hunting	11	21,606	893	20,713	4.1	95.9
Mining, extraction, and support activities	21	14,969	331	14,638	2.2	97.8
Utilities	22	2,684	95	2,589	3.5	96.5
Construction	23	613,110	37,240	575,870	6.1	93.9
Wholesale trade	42	257,153	34,550	222,603	13.4	86.6
Retail trade	44–45	560,952	75,374	485,578	13.4	86.6
Transportation and warehousing	48–49	152,463	8,277	144,186	5.4	94.6
Information	51	61,638	8,842	52,796	14.3	85.7
Publishing	511	17,590	2,812	14,778	16.0	84.0
Newspaper, periodical, book, and directory publishers	5111	9,761	1,355	8,406	13.9	86.1
Software publishers	5112	7,828	1,456	6,372	18.6	81.4



TABLE 37

**Companies with new or improved business processes: Marketing methods, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovating marketing methods			
			Number		Percent	
			Yes	No	Yes	No
Telecommunications	517	7,164	1,198	5,966	16.7	83.3
Data processing, hosting, and related services	518	8,918	1,224	7,694	13.7	86.3
Other information	other 51	27,965	3,609	24,356	12.9	87.1
Finance and insurance	52	200,857	22,054	178,803	11.0	89.0
Real estate and rental and leasing	53	255,783	21,795	233,988	8.5	91.5
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	201	1,611	11.1	88.9
Other real estate and rental and leasing	other 53	253,970	21,593	232,377	8.5	91.5
Professional, scientific, and technical services	54	695,672	61,777	633,895	8.9	91.1
Legal services	5411	152,243	8,963	143,280	5.9	94.1
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	4,725	101,909	4.4	95.6
Architectural, engineering, and related services	5413	88,491	5,879	82,612	6.6	93.4
Specialized design services	5414	26,282	3,127	23,155	11.9	88.1
Computer systems design and related services	5415	95,950	11,679	84,271	12.2	87.8
Management, scientific, and technical consulting services	5416	132,989	15,660	117,329	11.8	88.2
Scientific research and development services	5417	9,798	720	9,078	7.3	92.7
Advertising, public relations, and related services	5418	27,677	4,938	22,739	17.8	82.2
Other professional, scientific, and technical services	5419	55,569	6,085	49,484	11.0	89.0
Management of companies and enterprises	55	2,409	38 r	2,371	1.6 r	98.4
Administrative and support and waste management and remediation services	56	287,807	25,952	261,855	9.0	91.0
Educational services	61	53,912	8,222	45,690	15.3	84.7
Health care and social assistance	62	519,556	39,742	479,814	7.6	92.4
Health care services	621–23	459,855	34,318	425,537	7.5	92.5
Social assistance	624	59,700	5,426	54,274	9.1	90.9
Arts, entertainment, and recreation	71	88,831	9,312	79,519	10.5	89.5
Accommodation and food services	72	453,059	57,355	395,704	12.7	87.3
Other services	81	345,125	30,949	314,176	9.0	91.0

r = relative standard error &gt; 50%.

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 38

**Companies with new or improved business processes: Marketing methods, by size of company: 2016–18**

(Number and percent)

Employment size	Companies (number)	Innovating marketing methods			
		Number		Percent	
		Yes	No	Yes	No
All companies	4,805,151	469,731	4,335,420	9.8	90.2
Micro companies					
1–4	2,667,724	220,466	2,447,258	8.3	91.7
5–9	936,576	107,571	829,005	11.5	88.5
Small companies					
10–19	579,513	67,474	512,039	11.6	88.4
20–49	402,199	47,727	354,472	11.9	88.1
Medium companies					
50–99	119,497	15,220	104,277	12.7	87.3
100–249	65,565	7,156	58,409	10.9	89.1
Large companies					
250–499	18,897	2,304	16,593	12.2	87.8
500–999	7,289	729	6,560	10.0	90.0
1,000–4,999	6,199	776	5,423	12.5	87.5
5,000–9,999	823	137	686	16.6	83.4
10,000–24,999	514	102	412	19.8	80.2
25,000 or more	358	70	288	19.6	80.4

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 39

**Companies with new or improved business processes: Information and communication systems, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovating information and communication systems			
			Number		Percent	
			Yes	No	Yes	No
All industries	11, 21–23, 31–33, 42–81	4,805,151	453,798	4,351,353	9.4	90.6
Manufacturing industries	31–33	217,565	24,572	192,993	11.3	88.7
Food	311	18,250	1,872	16,378	10.3	89.7
Beverage and tobacco products	312	7,723	900	6,823	11.7	88.3
Textile, apparel, and leather products	313–16	10,554	1,045	9,509	9.9	90.1
Wood products	321	11,012	863	10,149	7.8	92.2
Paper	322	2,117	207	1,910	9.8	90.2
Printing and related support activities	323	20,851	2,427	18,424	11.6	88.4
Petroleum and coal products	324	583	35	548	6.0	94.0
Chemicals	325	7,522	1,003	6,519	13.3	86.7
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	75	518	12.6	87.4
Pharmaceuticals and medicines	3254	1,365	197	1,168	14.4	85.6
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	250	1,386	15.3	84.7
Other chemicals	other 325	3,927	479	3,448	12.2	87.8
Plastics and rubber products	326	8,087	923	7,164	11.4	88.6
Nonmetallic mineral products	327	7,749	615	7,134	7.9	92.1
Primary metals	331	2,537	293	2,244	11.5	88.5
Fabricated metal products	332	48,472	5,455	43,017	11.3	88.7
Machinery	333	18,558	2,347	16,211	12.6	87.4
Computer and electronic products	334	9,036	1,460	7,576	16.2	83.8
Communications equipment	3342	974	260	714	26.7	73.3
Semiconductor and other electronic components	3344	2,796	402	2,394	14.4	85.6
Navigational, measuring, electromedical, and control instruments	3345	3,909	597	3,312	15.3	84.7
Other computer and electronic products	other 334	1,359	200	1,159	14.7	85.3
Electrical equipment, appliances, and components	335	4,000	672	3,328	16.8	83.2
Transportation equipment	336	7,175	813	6,362	11.3	88.7
Automobiles, bodies, trailers, and parts	3361–63	4,565	476	4,089	10.4	89.6
Aerospace products and parts	3364	985	117	868	11.9	88.1
Other transportation	other 336	1,625	222	1,403	13.7	86.3
Furniture and related products	337	12,647	1,041	11,606	8.2	91.8
Miscellaneous	339	20,669	2,608	18,061	12.6	87.4
Medical equipment and supplies	3391	8,060	1,274	6,786	15.8	84.2
Other miscellaneous manufacturing	3399	12,608	1,335	11,273	10.6	89.4
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	429,228	4,158,358	9.4	90.6
Agriculture, forestry, fishing, and hunting	11	21,606	776	20,830	3.6	96.4
Mining, extraction, and support activities	21	14,969	491	14,478	3.3	96.7
Utilities	22	2,684	243	2,441	9.1	90.9
Construction	23	613,110	36,780	576,330	6.0	94.0
Wholesale trade	42	257,153	27,702	229,451	10.8	89.2
Retail trade	44–45	560,952	52,823	508,129	9.4	90.6
Transportation and warehousing	48–49	152,463	14,562	137,901	9.6	90.4
Information	51	61,638	10,594	51,044	17.2	82.8
Publishing	511	17,590	3,413	14,177	19.4	80.6
Newspaper, periodical, book, and directory publishers	5111	9,761	948	8,813	9.7	90.3

TABLE 39

**Companies with new or improved business processes: Information and communication systems, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovating information and communication systems			
			Number		Percent	
			Yes	No	Yes	No
Software publishers	5112	7,828	2,466	5,362	31.5	68.5
Telecommunications	517	7,164	1,384	5,780	19.3	80.7
Data processing, hosting, and related services	518	8,918	2,282	6,636	25.6	74.4
Other information	other 51	27,965	3,516	24,449	12.6	87.4
Finance and insurance	52	200,857	24,950	175,907	12.4	87.6
Real estate and rental and leasing	53	255,783	18,494	237,289	7.2	92.8
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	157 r	1,655	8.7 r	91.3
Other real estate and rental and leasing	other 53	253,970	18,338	235,632	7.2	92.8
Professional, scientific, and technical services	54	695,672	81,489	614,183	11.7	88.3
Legal services	5411	152,243	11,135	141,108	7.3	92.7
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	10,773	95,861	10.1	89.9
Architectural, engineering, and related services	5413	88,491	9,064	79,427	10.2	89.8
Specialized design services	5414	26,282	2,365	23,917	9.0	91.0
Computer systems design and related services	5415	95,950	24,336	71,614	25.4	74.6
Management, scientific, and technical consulting services	5416	132,989	13,491	119,498	10.1	89.9
Scientific research and development services	5417	9,798	1,186	8,612	12.1	87.9
Advertising, public relations, and related services	5418	27,677	2,548	25,129	9.2	90.8
Other professional, scientific, and technical services	5419	55,569	6,592	48,977	11.9	88.1
Management of companies and enterprises	55	2,409	233	2,176	9.7	90.3
Administrative and support and waste management and remediation services	56	287,807	25,426	262,381	8.8	91.2
Educational services	61	53,912	6,198	47,714	11.5	88.5
Health care and social assistance	62	519,556	54,561	464,995	10.5	89.5
Health care services	621–23	459,855	48,112	411,743	10.5	89.5
Social assistance	624	59,700	6,449	53,251	10.8	89.2
Arts, entertainment, and recreation	71	88,831	5,725	83,106	6.4	93.6
Accommodation and food services	72	453,059	39,889	413,170	8.8	91.2
Other services	81	345,125	28,284	316,841	8.2	91.8

r = relative standard error &gt; 50%.

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 40

**Companies with new or improved business processes: Information and communication systems, by size of company: 2016–18**

(Number and percent)

Employment size	Companies (number)	Innovating information and communication systems			
		Number		Percent	
		Yes	No	Yes	No
All companies	4,805,151	453,798	4,351,353	9.4	90.6
Micro companies					
1–4	2,667,724	198,342	2,469,382	7.4	92.6
5–9	936,576	102,460	834,116	10.9	89.1
Small companies					
10–19	579,513	69,156	510,357	11.9	88.1
20–49	402,199	51,387	350,812	12.8	87.2
Medium companies					
50–99	119,497	17,130	102,367	14.3	85.7
100–249	65,565	9,388	56,177	14.3	85.7
Large companies					
250–499	18,897	3,190	15,707	16.9	83.1
500–999	7,289	1,083	6,206	14.9	85.1
1,000–4,999	6,199	1,242	4,957	20.0 r	80.0
5,000–9,999	823	176	647	21.4	78.6
10,000–24,999	514	141	373	27.4	72.6
25,000 or more	358	105	253	29.3	70.7 r

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 41

**Companies with new or improved business processes: Administration and management activities, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovating administration and management activities			
			Number		Percent	
			Yes	No	Yes	No
All industries	11, 21–23, 31–33, 42–81	4,805,151	424,549	4,380,602	8.8	91.2
Manufacturing industries	31–33	217,565	22,995	194,570	10.6	89.4
Food	311	18,250	2,243	16,007	12.3	87.7
Beverage and tobacco products	312	7,723	1,263	6,460	16.4	83.6
Textile, apparel, and leather products	313–16	10,554	921	9,633	8.7	91.3
Wood products	321	11,012	814	10,198	7.4	92.6
Paper	322	2,117	189	1,928	8.9	91.1
Printing and related support activities	323	20,851	1,627	19,224	7.8	92.2
Petroleum and coal products	324	583	53	530	9.1	90.9
Chemicals	325	7,522	1,060	6,462	14.1	85.9
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	83	510	14.0	86.0
Pharmaceuticals and medicines	3254	1,365	224	1,141	16.4	83.6
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	195	1,441	11.9	88.1
Other chemicals	other 325	3,927	562	3,365	14.3	85.7
Plastics and rubber products	326	8,087	960	7,127	11.9	88.1
Nonmetallic mineral products	327	7,749	588	7,161	7.6	92.4
Primary metals	331	2,537	312	2,225	12.3	87.7
Fabricated metal products	332	48,472	5,040	43,432	10.4	89.6
Machinery	333	18,558	2,260	16,298	12.2	87.8
Computer and electronic products	334	9,036	944	8,092	10.4	89.6
Communications equipment	3342	974	126	848	12.9	87.1
Semiconductor and other electronic components	3344	2,796	382	2,414	13.7	86.3
Navigational, measuring, electromedical, and control instruments	3345	3,909	331	3,578	8.5	91.5
Other computer and electronic products	other 334	1,359	107	1,252	7.9	92.1
Electrical equipment, appliances, and components	335	4,000	581	3,419	14.5	85.5
Transportation equipment	336	7,175	749	6,426	10.4	89.6
Automobiles, bodies, trailers, and parts	3361–63	4,565	408	4,157	8.9	91.1
Aerospace products and parts	3364	985	108	877	11.0	89.0
Other transportation	other 336	1,625	233	1,392	14.3	85.7
Furniture and related products	337	12,647	1,143	11,504	9.0	91.0
Miscellaneous	339	20,669	2,245	18,424	10.9	89.1
Medical equipment and supplies	3391	8,060	883	7,177	11.0	89.0
Other miscellaneous manufacturing	3399	12,608	1,361	11,247	10.8	89.2
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	401,555	4,186,031	8.8	91.2
Agriculture, forestry, fishing, and hunting	11	21,606	1,188	20,418	5.5	94.5
Mining, extraction, and support activities	21	14,969	505	14,464	3.4	96.6
Utilities	22	2,684	155	2,529	5.8	94.2
Construction	23	613,110	47,598	565,512	7.8	92.2
Wholesale trade	42	257,153	24,294	232,859	9.4	90.6
Retail trade	44–45	560,952	45,483	515,469	8.1	91.9
Transportation and warehousing	48–49	152,463	12,975	139,488	8.5	91.5
Information	51	61,638	6,515	55,123	10.6	89.4
Publishing	511	17,590	2,052	15,538	11.7	88.3
Newspaper, periodical, book, and directory publishers	5111	9,761	706	9,055	7.2	92.8

TABLE 41

**Companies with new or improved business processes: Administration and management activities, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovating administration and management activities			
			Number		Percent	
			Yes	No	Yes	No
Software publishers	5112	7,828	1,346	6,482	17.2	82.8
Telecommunications	517	7,164	795	6,369	11.1	88.9
Data processing, hosting, and related services	518	8,918	1,219	7,699	13.7	86.3
Other information	other 51	27,965	2,448	25,517	8.8	91.2
Finance and insurance	52	200,857	18,363	182,494	9.1	90.9
Real estate and rental and leasing	53	255,783	20,776	235,007	8.1	91.9
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	113 r	1,699	6.2 r	93.8
Other real estate and rental and leasing	other 53	253,970	20,662	233,308	8.1	91.9
Professional, scientific, and technical services	54	695,672	66,843	628,829	9.6	90.4
Legal services	5411	152,243	8,912	143,331	5.9	94.1
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	9,834	96,800	9.2	90.8
Architectural, engineering, and related services	5413	88,491	7,341	81,150	8.3	91.7
Specialized design services	5414	26,282	2,245	24,037	8.5	91.5
Computer systems design and related services	5415	95,950	12,713	83,237	13.2	86.8
Management, scientific, and technical consulting services	5416	132,989	17,258	115,731	13.0	87.0
Scientific research and development services	5417	9,798	820	8,978	8.4	91.6
Advertising, public relations, and related services	5418	27,677	2,687	24,990	9.7	90.3
Other professional, scientific, and technical services	5419	55,569	5,035	50,534	9.1	90.9
Management of companies and enterprises	55	2,409	179	2,230	7.4	92.6
Administrative and support and waste management and remediation services	56	287,807	28,893	258,914	10.0	90.0
Educational services	61	53,912	6,763	47,149	12.5	87.5
Health care and social assistance	62	519,556	51,157	468,399	9.8	90.2
Health care services	621–23	459,855	42,331	417,524	9.2	90.8
Social assistance	624	59,700	8,825	50,875	14.8	85.2
Arts, entertainment, and recreation	71	88,831	6,254	82,577	7.0	93.0
Accommodation and food services	72	453,059	39,562	413,497	8.7	91.3
Other services	81	345,125	24,050	321,075	7.0	93.0

r = relative standard error &gt; 50%.

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 42

**Companies with new or improved business processes: Administration and management activities, by size of company: 2016–18**

(Number and percent)

Employment size	Companies (number)	Innovating administration and management activities					
		Number			Percent		
		Yes	No	Yes	No		
All companies	4,805,151	424,549	4,380,602	8.8	91.2		
Micro companies							
1–4	2,667,724	181,527	2,486,197	6.8	93.2		
5–9	936,576	95,614	840,962	10.2	89.8		
Small companies							
10–19	579,513	66,941	512,572	11.6	88.4		
20–49	402,199	49,813	352,386	12.4	87.6		
Medium companies							
50–99	119,497	16,153	103,344	13.5	86.5		
100–249	65,565	9,203	56,362	14.0	86.0		
Large companies							
250–499	18,897	3,142	15,755	16.6	83.4		
500–999	7,289	847	6,442	11.6	88.4		
1,000–4,999	6,199	976	5,223	15.7	84.3	r	
5,000–9,999	823	146	677	17.7	82.3		
10,000–24,999	514	110	404	21.4	78.6		
25,000 or more	358	77	281	21.5	78.5	r	

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.



TABLE 43

**Companies with new or improved business processes: Product and business process development activities, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovating product and business process development activities			
			Number		Percent	
			Yes	No	Yes	No
All industries	11, 21–23, 31–33, 42–81	4,805,151	339,941	4,465,210	7.1	92.9
Manufacturing industries	31–33	217,565	27,908	189,657	12.8	87.2
Food	311	18,250	2,345	15,905	12.8	87.2
Beverage and tobacco products	312	7,723	1,188	6,535	15.4	84.6
Textile, apparel, and leather products	313–16	10,554	1,057	9,497	10.0	90.0
Wood products	321	11,012	848	10,164	7.7	92.3
Paper	322	2,117	162	1,955	7.7	92.3
Printing and related support activities	323	20,851	1,743	19,108	8.4	91.6
Petroleum and coal products	324	583	88	495	15.1	84.9
Chemicals	325	7,522	1,419	6,103	18.9	81.1
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	59	534	9.9	90.1
Pharmaceuticals and medicines	3254	1,365	288	1,077	21.1	78.9
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	323	1,313	19.7	80.3
Other chemicals	other 325	3,927	750	3,177	19.1	80.9
Plastics and rubber products	326	8,087	1,435	6,652	17.7	82.3
Nonmetallic mineral products	327	7,749	665	7,084	8.6	91.4
Primary metals	331	2,537	324	2,213	12.8	87.2
Fabricated metal products	332	48,472	5,887	42,585	12.1	87.9
Machinery	333	18,558	3,308	15,250	17.8	82.2
Computer and electronic products	334	9,036	1,677	7,359	18.6	81.4
Communications equipment	3342	974	210	764	21.6	78.4
Semiconductor and other electronic components	3344	2,796	590	2,206	21.1	78.9
Navigational, measuring, electromedical, and control instruments	3345	3,909	686	3,223	17.5	82.5
Other computer and electronic products	other 334	1,359	193	1,166	14.2	85.8
Electrical equipment, appliances, and components	335	4,000	760	3,240	19.0	81.0
Transportation equipment	336	7,175	905	6,270	12.6	87.4
Automobiles, bodies, trailers, and parts	3361–63	4,565	506	4,059	11.1	88.9
Aerospace products and parts	3364	985	188	797	19.1	80.9
Other transportation	other 336	1,625	210	1,415	12.9	87.1
Furniture and related products	337	12,647	1,192	11,455	9.4	90.6
Miscellaneous	339	20,669	2,900	17,769	14.0	86.0
Medical equipment and supplies	3391	8,060	1,346	6,714	16.7	83.3
Other miscellaneous manufacturing	3399	12,608	1,553	11,055	12.3	87.7
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	312,034	4,275,552	6.8	93.2
Agriculture, forestry, fishing, and hunting	11	21,606	940	20,666	4.4	95.6
Mining, extraction, and support activities	21	14,969	346	14,623	2.3	97.7
Utilities	22	2,684	152	2,532	5.7	94.3
Construction	23	613,110	30,715	582,395	5.0	95.0
Wholesale trade	42	257,153	26,210	230,943	10.2	89.8
Retail trade	44–45	560,952	37,918	523,034	6.8	93.2
Transportation and warehousing	48–49	152,463	7,197	145,266	4.7	95.3
Information	51	61,638	7,680	53,958	12.5	87.5
Publishing	511	17,590	2,489	15,101	14.2	85.8
Newspaper, periodical, book, and directory publishers	5111	9,761	734	9,027	7.5	92.5

TABLE 43

**Companies with new or improved business processes: Product and business process development activities, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovating product and business process development activities			
			Number		Percent	
			Yes	No	Yes	No
Software publishers	5112	7,828	1,755	6,073	22.4	77.6
Telecommunications	517	7,164	762	6,402	10.6	89.4
Data processing, hosting, and related services	518	8,918	1,403	7,515	15.7	84.3
Other information	other 51	27,965	3,025	24,940	10.8	89.2
Finance and insurance	52	200,857	16,178	184,679	8.1	91.9
Real estate and rental and leasing	53	255,783	11,435	244,348	4.5	95.5
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	142 r	1,670	7.8 r	92.2
Other real estate and rental and leasing	other 53	253,970	11,293	242,677	4.4	95.6
Professional, scientific, and technical services	54	695,672	61,718	633,954	8.9	91.1
Legal services	5411	152,243	5,195	147,048	3.4	96.6
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	5,180	101,454	4.9	95.1
Architectural, engineering, and related services	5413	88,491	7,871	80,620	8.9	91.1
Specialized design services	5414	26,282	2,235	24,047	8.5	91.5
Computer systems design and related services	5415	95,950	16,166	79,784	16.8	83.2
Management, scientific, and technical consulting services	5416	132,989	16,905	116,084	12.7	87.3
Scientific research and development services	5417	9,798	1,575	8,223	16.1	83.9
Advertising, public relations, and related services	5418	27,677	2,612	25,065	9.4	90.6
Other professional, scientific, and technical services	5419	55,569	3,979	51,590	7.2	92.8
Management of companies and enterprises	55	2,409	123	2,286	5.1	94.9
Administrative and support and waste management and remediation services	56	287,807	18,042	269,765	6.3	93.7
Educational services	61	53,912	5,905	48,007	11.0	89.0
Health care and social assistance	62	519,556	32,782	486,774	6.3	93.7
Health care services	621–23	459,855	27,546	432,309	6.0	94.0
Social assistance	624	59,700	5,235	54,465	8.8	91.2
Arts, entertainment, and recreation	71	88,831	4,937	83,894	5.6	94.4
Accommodation and food services	72	453,059	29,540	423,519	6.5	93.5
Other services	81	345,125	20,216	324,909	5.9	94.1

r = relative standard error &gt; 50%.

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 44

**Companies with new or improved business processes: Product and business process development activities, by size of company: 2016–18**

(Number and percent)

Employment size	Companies (number)	Innovating product and business process development activities					
		Number			Percent		
		Yes	No	Yes	No		
All companies	4,805,151	339,941	4,465,210	7.1	92.9		
Micro companies							
1–4	2,667,724	155,548	2,512,176	5.8	94.2		
5–9	936,576	75,718	860,858	8.1	91.9		
Small companies							
10–19	579,513	48,618	530,895	8.4	91.6		
20–49	402,199	36,185	366,014	9.0	91.0		
Medium companies							
50–99	119,497	13,164	106,333	11.0	89.0		
100–249	65,565	6,578	58,987	10.0	90.0		
Large companies							
250–499	18,897	2,258	16,639	11.9	88.1		
500–999	7,289	810	6,479	11.1	88.9		
1,000–4,999	6,199	729	5,470	11.8	88.2		
5,000–9,999	823	151	672	18.3	81.7		
10,000–24,999	514	111	403	21.6	78.4		
25,000 or more	358	71	287	19.8	80.2	r	

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 45

**Companies with product or business process innovation, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Product or business process innovation			
			Number		Percent	
			Yes	No	Yes	No
All industries	11, 21–23, 31–33, 42–81	4,805,151	1,428,609	3,376,542	29.7	70.3
Manufacturing industries	31–33	217,565	77,332	140,233	35.5	64.5
Food	311	18,250	7,297	10,953	40.0	60.0
Beverage and tobacco products	312	7,723	3,547	4,176	45.9	54.1
Textile, apparel, and leather products	313–16	10,554	3,493	7,061	33.1	66.9
Wood products	321	11,012	2,795	8,217	25.4	74.6
Paper	322	2,117	794	1,323	37.5	62.5
Printing and related support activities	323	20,851	6,752	14,099	32.4	67.6
Petroleum and coal products	324	583	177	406	30.4	69.6
Chemicals	325	7,522	3,087	4,435	41.0	59.0
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	233	360	39.3	60.7
Pharmaceuticals and medicines	3254	1,365	711	654	52.1	47.9
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	673	963	41.1	58.9
Other chemicals	other 325	3,927	1,470	2,457	37.4	62.6
Plastics and rubber products	326	8,087	3,420	4,667	42.3	57.7
Nonmetallic mineral products	327	7,749	2,328	5,421	30.0	70.0
Primary metals	331	2,537	871	1,666	34.3	65.7
Fabricated metal products	332	48,472	15,013	33,459	31.0	69.0
Machinery	333	18,558	7,256	11,302	39.1	60.9
Computer and electronic products	334	9,036	4,366	4,670	48.3	51.7
Communications equipment	3342	974	517	457	53.1	46.9
Semiconductor and other electronic components	3344	2,796	1,286	1,510	46.0	54.0
Navigational, measuring, electromedical, and control instruments	3345	3,909	1,952	1,957	49.9	50.1
Other computer and electronic products	other 334	1,359	613	746	45.1	54.9
Electrical equipment, appliances, and components	335	4,000	1,745	2,255	43.6	56.4
Transportation equipment	336	7,175	2,450	4,725	34.1	65.9
Automobiles, bodies, trailers, and parts	3361–63	4,565	1,531	3,034	33.5	66.5
Aerospace products and parts	3364	985	370	615	37.6	62.4
Other transportation	other 336	1,625	550	1,075	33.8	66.2
Furniture and related products	337	12,647	3,747	8,900	29.6	70.4
Miscellaneous	339	20,669	8,187	12,482	39.6	60.4
Medical equipment and supplies	3391	8,060	3,197	4,863	39.7	60.3
Other miscellaneous manufacturing	3399	12,608	4,991	7,617	39.6	60.4
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	1,351,279	3,236,307	29.5	70.5
Agriculture, forestry, fishing, and hunting	11	21,606	4,516	17,090	20.9	79.1
Mining, extraction, and support activities	21	14,969	2,470	12,499	16.5	83.5
Utilities	22	2,684	629	2,055	23.4	76.6
Construction	23	613,110	129,921	483,189	21.2	78.8
Wholesale trade	42	257,153	86,559	170,594	33.7	66.3
Retail trade	44–45	560,952	170,389	390,563	30.4	69.6
Transportation and warehousing	48–49	152,463	42,151	110,312	27.6	72.4
Information	51	61,638	24,362	37,276	39.5	60.5
Publishing	511	17,590	7,422	10,168	42.2	57.8
Newspaper, periodical, book, and directory publishers	5111	9,761	3,066	6,695	31.4	68.6
Software publishers	5112	7,828	4,356	3,472	55.6	44.4

TABLE 45

**Companies with product or business process innovation, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Product or business process innovation			
			Number		Percent	
			Yes	No	Yes	No
Telecommunications	517	7,164	2,615	4,549	36.5	63.5
Data processing, hosting, and related services	518	8,918	4,098	4,820	46.0	54.0
Other information	other 51	27,965	10,229	17,736	36.6	63.4
Finance and insurance	52	200,857	74,353	126,504	37.0	63.0
Real estate and rental and leasing	53	255,783	66,657	189,126	26.1	73.9
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	410	1,402	22.6	77.4
Other real estate and rental and leasing	other 53	253,970	66,246	187,724	26.1	73.9
Professional, scientific, and technical services	54	695,672	240,310	455,362	34.5	65.5
Legal services	5411	152,243	36,852	115,391	24.2	75.8
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	32,911	73,723	30.9	69.1
Architectural, engineering, and related services	5413	88,491	29,705	58,786	33.6	66.4
Specialized design services	5414	26,282	8,544	17,738	32.5	67.5
Computer systems design and related services	5415	95,950	45,311	50,639	47.2	52.8
Management, scientific, and technical consulting services	5416	132,989	53,584	79,405	40.3	59.7
Scientific research and development services	5417	9,798	3,994	5,804	40.8	59.2
Advertising, public relations, and related services	5418	27,677	10,365	17,312	37.4	62.6
Other professional, scientific, and technical services	5419	55,569	19,043	36,526	34.3	65.7
Management of companies and enterprises	55	2,409	501	1,908	20.8	79.2
Administrative and support and waste management and remediation services	56	287,807	83,631	204,176	29.1	70.9
Educational services	61	53,912	22,242	31,670	41.3	58.7
Health care and social assistance	62	519,556	158,676	360,880	30.5	69.5
Health care services	621–23	459,855	137,146	322,709	29.8	70.2
Social assistance	624	59,700	21,529	38,171	36.1	63.9
Arts, entertainment, and recreation	71	88,831	26,345	62,486	29.7	70.3
Accommodation and food services	72	453,059	127,292	325,767	28.1	71.9
Other services	81	345,125	90,273	254,852	26.2	73.8

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 46

**Companies with product or business process innovation, by size of company: 2016–18**

(Number and percent)

Employment size	Companies (number)	Product or business process innovation			
		Number		Percent	
		Yes	No	Yes	No
All companies	4,805,151	1,428,609	3,376,542	29.7	70.3
Micro companies					
1–4	2,667,724	745,109	1,922,615	27.9	72.1
5–9	936,576	295,942	640,634	31.6	68.4
Small companies					
10–19	579,513	185,636	393,877	32.0	68.0
20–49	402,199	129,014	273,185	32.1	67.9
Medium companies					
50–99	119,497	39,093	80,404	32.7	67.3
100–249	65,565	21,658	43,907	33.0	67.0
Large companies					
250–499	18,897	6,468	12,429	34.2	65.8
500–999	7,289	2,499	4,790	34.3	65.7
1,000–4,999	6,199	2,442	3,757	39.4	60.6
5,000–9,999	823	355	468	43.1	56.9
10,000–24,999	514	232	282	45.1	54.9
25,000 or more	358	166	192	46.4	53.6 r

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 47

**Companies with product or business process innovation, by firm classification of sex: 2016–18**

(Number and percent)

Sex of owners	Companies (number)	Product or business process innovation			
		Number		Percent	
		Yes	No	Yes	No
All companies (sex of owner)	4,805,151	1,428,609	3,376,542	29.7	70.3
Female majority owned	987,899	313,833	674,066	31.8	68.2
Male majority owned	3,028,739	883,701	2,145,038	29.2	70.8
Equally owned by male and female	745,304	217,798	527,506	29.2	70.8
Unclassifiable	43,211	13,279	29,932	30.7	69.3

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 48

**Companies with product or business process innovation, by firm classification of race and ethnicity: 2016–18**

(Number and percent)

Race and ethnicity of owners	Companies (number)	Product or business process innovation			
		Number		Percent	
		Yes	No	Yes	No
All companies (race and ethnicity)	4,805,151	1,428,609	3,376,542	29.7	70.3
Race					
White	4,170,180	1,200,084	2,970,096	28.8	71.2
Asian	473,828	175,829	297,999	37.1	62.9
Black or African American	94,492	32,606	61,886	34.5	65.5
American Indian or Alaska Native	21,567	6,760	14,807	31.3	68.7
Native Hawaiian or Other Pacific Islander	5,446	1,412	4,034	25.9	74.1
Ethnicity					
Hispanic or Latino	271,545	98,245	173,300	36.2	63.8
Equally Hispanic and not Hispanic	41,138	13,972	27,166	34.0	66.0
Not Hispanic	4,449,259	1,303,116	3,146,143	29.3	70.7
Minority status					
Minority	853,539	309,153	544,386	36.2	63.8
Black or African American, American Indian or Alaska Native, or Hispanic or Latino	376,112	132,508	243,604	35.2	64.8
Equally minority and nonminority	71,956	23,872	48,084	33.2	66.8
Nonminority	3,836,446	1,082,306	2,754,140	28.2	71.8
Unclassifiable	43,211	13,279	29,932	30.7	69.3

**Note(s):**

Detail may not add to total because of rounding. Companies may be included in one or more race and ethnicity category. Companies classified as "minority" are those companies classified as any race and ethnicity combination other than not Hispanic and White. 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.



TABLE 49

**Companies with product or business process innovation, by state: 2016–18**

(Number and percent)

State	Companies (number)	Product or business process innovation			
		Number		Percent	
		Yes	No	Yes	No
All states	4,805,151	1,428,609	3,376,542	29.7	70.3
Alabama	55,146	13,244	41,902	24.0	76.0
Alaska	12,297	3,997	8,300	32.5	67.5
Arizona	82,414	25,476	56,938	30.9	69.1
Arkansas	39,656	9,427	30,229	23.8	76.2
California	594,609	198,609	396,000	33.4	66.6
Colorado	116,495	37,228	79,267	32.0	68.0
Connecticut	53,726	15,475	38,251	28.8	71.2
Delaware	14,472	4,421	10,051	30.5	69.5
District of Columbia	7,748	2,578	5,170	33.3	66.7
Florida	353,892	111,063	242,829	31.4	68.6
Georgia	135,369	40,976	94,393	30.3	69.7
Hawaii	18,391	5,191	13,200	28.2	71.8
Idaho	33,993	9,350	24,643	27.5	72.5
Illinois	201,013	59,952	141,061	29.8	70.2
Indiana	89,129	25,891	63,238	29.0	71.0
Iowa	52,742	11,975	40,767	22.7	77.3
Kansas	46,476	11,806	34,670	25.4	74.6
Kentucky	53,421	14,601	38,820	27.3	72.7
Louisiana	58,237	15,017	43,220	25.8	74.2
Maine	24,943	6,882	18,061	27.6	72.4
Maryland	83,878	25,340	58,538	30.2	69.8
Massachusetts	102,125	29,230	72,895	28.6	71.4
Michigan	140,485	38,549	101,936	27.4	72.6
Minnesota	98,880	29,458	69,422	29.8	70.2
Mississippi	31,804	8,389	23,415	26.4	73.6
Missouri	86,368	24,534	61,834	28.4	71.6
Montana	27,636	6,938	20,698	25.1	74.9
Nebraska	37,855	10,277	27,578	27.1	72.9
Nevada	37,738	11,475	26,263	30.4	69.6
New Hampshire	23,942	5,990	17,952	25.0	75.0
New Jersey	143,259	43,554	99,705	30.4	69.6
New Mexico	24,530	7,225	17,305	29.5	70.5
New York	318,382	97,907	220,475	30.8	69.2
North Carolina	146,412	39,183	107,229	26.8	73.2
North Dakota	15,827	3,606	12,221	22.8	77.2
Ohio	148,853	44,940	103,913	30.2	69.8
Oklahoma	55,458	13,960	41,498	25.2	74.8
Oregon	78,566	24,474	54,092	31.2	68.8
Pennsylvania	183,297	52,392	130,905	28.6	71.4
Rhode Island	16,775	4,782	11,993	28.5	71.5
South Carolina	63,398	18,195	45,203	28.7	71.3
South Dakota	18,018	4,418	13,600	24.5	75.5
Tennessee	71,803	19,352	52,451	27.0	73.0
Texas	323,126	99,729	223,397	30.9	69.1
Utah	54,544	17,174	37,370	31.5	68.5
Vermont	13,776	3,786	9,990	27.5	72.5
Virginia	120,855	35,481	85,374	29.4	70.6

TABLE 49

**Companies with product or business process innovation, by state: 2016–18**

(Number and percent)

State	Companies (number)	Product or business process innovation			
		Number		Percent	
		Yes	No	Yes	No
Washington	121,736	36,476	85,260	30.0	70.0
West Virginia	20,066	4,595	15,471	22.9	77.1
Wisconsin	95,652	25,774	69,878	26.9	73.1
Wyoming	13,264	3,486	9,778	26.3	73.7
Undistributed	42,675	14,787	27,888	34.7	65.3

**Note(s):**

Detail may not add to total because of rounding.

**Source(s):**

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

TABLE 50

**Companies that reported product innovation, by industry and innovation R&D activity: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovation R&D activity			
			Number		Percent	
			Yes	No	Yes	No
All industries	11, 21–23, 31–33, 42–81	919,293	202,799	716,495	22.1	77.9
Manufacturing industries	31–33	46,960	22,515	24,444	47.9	52.1
Food	311	4,123	1,687	2,436	40.9	59.1
Beverage and tobacco products	312	2,303	1,282	1,022	55.6	44.4
Textile, apparel, and leather products	313–16	2,210	774	1,435	35.0	65.0
Wood products	321	1,608	537	1,070	33.4	66.6
Paper	322	466	176	290	37.8	62.2
Printing and related support activities	323	4,190	970	3,219	23.2	76.8
Petroleum and coal products	324	77	47	31	59.7	40.3
Chemicals	325	2,010	1,444	564	71.9	28.1
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	141	106	35	75.2	24.8
Pharmaceuticals and medicines	3254	478	345	135	72.0	28.0
Soap, cleaning compound, and toilet preparation manufacturing	3256	458	319	140	69.4	30.6
Other chemicals	other 325	933	676	256	72.6	27.4
Plastics and rubber products	326	2,181	1,217	965	55.8	44.2
Nonmetallic mineral products	327	1,394	451	944	32.4	67.6
Primary metals	331	351	170	180	48.4	51.6
Fabricated metal products	332	7,348	3,121	4,226	42.5	57.5
Machinery	333	5,008	3,547	1,463	70.8	29.2
Computer and electronic products	334	3,310	2,274	1,035	68.7	31.3
Communications equipment	3342	421	330	90	78.6	21.4
Semiconductor and other electronic components	3344	816	526	291	64.3	35.7
Navigational, measuring, electromedical, and control instruments	3345	1,581	1,105	477	69.8	30.2
Other computer and electronic products	other 334	491	312	178	63.7	36.3
Electrical equipment, appliances, and components	335	1,195	832	362	69.7	30.3
Transportation equipment	336	1,609	906	704	56.2	43.8
Automobiles, bodies, trailers, and parts	3361–63	1,019	569	451	55.7	44.3
Aerospace products and parts	3364	252	163	89	64.7	35.3
Other transportation	other 336	337	174	164	51.3	48.7
Furniture and related products	337	2,120	853	1,268	40.2	59.8
Miscellaneous	339	5,451	2,230	3,221	40.9	59.1
Medical equipment and supplies	3391	2,145	862	1,284	40.2	59.8
Other miscellaneous manufacturing	3399	3,306	1,369	1,936	41.4	58.6
Nonmanufacturing industries	11, 21–23, 42–81	872,334	180,283	692,050	20.7	79.3
Agriculture, forestry, fishing, and hunting	11	2,620	409	2,209	15.6	84.4
Mining, extraction, and support activities	21	1,615	162	1,454	10.0	90.0
Utilities	22	389	53	335	13.6	86.4
Construction	23	73,745	11,133	62,611	15.1	84.9
Wholesale trade	42	55,446	15,930	39,517	28.7	71.3
Retail trade	44–45	103,248	19,508	83,742	18.9	81.1
Transportation and warehousing	48–49	21,184	2,530	18,653	11.9	88.1
Information	51	17,920	8,085	9,834	45.1	54.9
Publishing	511	5,681	3,189	2,491	56.2	43.8
Newspaper, periodical, book, and directory publishers	5111	2,236	656	1,578	29.4	70.6
Software publishers	5112	3,444	2,532	912	73.5	26.5

TABLE 50

**Companies that reported product innovation, by industry and innovation R&D activity: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovation R&D activity			
			Number		Percent	
			Yes	No	Yes	No
Telecommunications	517	1,837	491	1,348	26.7	73.3
Data processing, hosting, and related services	518	3,133	1,844	1,288	58.9	41.1
Other information	other 51	7,270	2,562	4,709	35.2	64.8
Finance and insurance	52	55,631	7,681	47,949	13.8	86.2
Real estate and rental and leasing	53	43,762	4,471	39,291	10.2	89.8
Lessors of nonfinancial intangible assets (except copyrighted works)	533	353	200	153	r 56.7	43.3
Other real estate and rental and leasing	other 53	43,410	4,272	39,139	9.8	90.2
Professional, scientific, and technical services	54	172,128	50,221	121,907	29.2	70.8
Legal services	5411	24,608	2,754	21,855	11.2	88.8
Accounting, tax preparation, bookkeeping, and payroll services	5412	22,979	1,868	21,112	8.1	91.9
Architectural, engineering, and related services	5413	21,800	7,371	14,428	33.8	66.2
Specialized design services	5414	5,258	1,628	3,631	31.0	69.0
Computer systems design and related services	5415	34,804	15,991	18,814	45.9	54.1
Management, scientific, and technical consulting services	5416	40,186	12,738	27,449	31.7	68.3
Scientific research and development services	5417	2,915	2,302	614	78.9	21.1
Advertising, public relations, and related services	5418	7,376	2,096	5,279	28.4	71.6
Other professional, scientific, and technical services	5419	12,200	3,475	8,726	28.5	71.5
Management of companies and enterprises	55	316	99	r 219	31.0	r 69.0
Administrative and support and waste management and remediation services	56	53,159	9,562	43,598	18.0	82.0
Educational services	61	16,492	5,107	11,384	31.0	69.0
Health care and social assistance	62	106,618	17,553	89,066	16.5	83.5
Health care services	621–23	91,272	14,361	76,912	15.7	84.3
Social assistance	624	15,345	3,192	12,152	20.8	79.2
Arts, entertainment, and recreation	71	19,099	3,983	15,115	20.9	79.1
Accommodation and food services	72	71,355	14,319	57,037	20.1	79.9
Other services	81	57,605	9,474	48,132	16.4	83.6

r = relative standard error &gt; 50%.

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. Innovation R&amp;D activity is based on unedited company responses to innovation questions, not R&amp;D expenditures. 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.

TABLE 51

**Companies that reported product innovation, by size of company and innovation R&D activity: 2016–18**

(Number and percent)

Employment size	Companies (number)	Innovation R&D activity			
		Number		Percent	
		Yes	No	Yes	No
All companies	919,293	202,799	716,495	22.1	77.9
Micro companies					
1–4	516,326	98,217	418,110	19.0	81.0
5–9	184,195	42,197	142,000	22.9	77.1
Small companies					
10–19	109,963	28,891	81,073	26.3	73.7
20–49	69,307	19,405	49,903	28.0	72.0
Medium companies					
50–99	21,481	7,153	14,328	33.3	66.7
100–249	11,177	3,804	7,374	34.0	66.0
Large companies					
250–499	3,467	1,356	2,110	39.1	60.9
500–999	1,442	719	722	49.9	50.1
1,000–4,999	1,401	700	700	50.0	50.0
5,000–9,999	247	160	88	64.4	35.6
10,000–24,999	175	122	54	69.1	30.9
25,000 or more	113	77	35	69.0	31.0

**Note(s):**

Detail may not add to total because of rounding. Innovation R&D activity is based on unedited company responses to innovation questions, not R&D expenditures. 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.

TABLE 52

**Companies that reported product innovation, by firm classification of sex and innovation R&D activity: 2016–18**

(Number and percent)

Sex of owners	Companies (number)	Innovation R&D activity			
		Number		Percent	
		Yes	No	Yes	No
All companies (sex of owner)	919,293	202,799	716,495	22.1	77.9
Female majority owned	203,269	41,194	162,073	20.3	79.7
Male majority owned	572,538	129,413	443,124	22.6	77.4
Equally owned by male and female	136,036	28,622	107,414	21.0	79.0
Unclassifiable	7,453	3,567	3,887	47.9	52.1

**Note(s):**

Detail may not add to total because of rounding. Innovation R&D activity is based on unedited company responses to innovation questions, not R&D expenditures. 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.

TABLE 53

**Companies that reported product innovation, by firm classification of race and ethnicity and innovation R&D activity: 2016–18**

(Number and percent)

Race and ethnicity of owners	Companies (number)	Innovation R&D activity			
		Number		Percent	
		Yes	No	Yes	No
All companies (race and ethnicity)	919,293	202,799	716,495	22.1	77.9
Race					
White	763,495	165,258	598,236	21.6	78.4
Asian	123,950	27,859	96,090	22.5	77.5
Black or African American	20,210	4,536	15,673	22.4	77.6
American Indian or Alaska Native	4,070	1,130	2,938	27.8	72.2
Native Hawaiian or Other Pacific Islander	928	215	713	23.2	76.8
Ethnicity					
Hispanic or Latino	60,494	12,451	48,042	20.6	79.4
Equally Hispanic and not Hispanic	9,249	1,797	7,453	19.4	80.6
Not Hispanic	842,098	184,980	657,117	22.0	78.0
Minority status					
Minority	206,018	45,126	160,893	21.9	78.1
Black or African American, American Indian or Alaska Native, or Hispanic or Latino	81,614	17,151	64,464	21.0	79.0
Equally minority and nonminority	15,955	4,354	11,600	27.3	72.7
Nonminority	689,871	149,751	540,118	21.7	78.3
Unclassifiable	7,453	3,567	3,887	47.9	52.1

**Note(s):**

Detail may not add to total because of rounding. Companies may be included in one or more race and ethnicity category. Companies classified as "minority" are those companies classified as any race and ethnicity combination other than not Hispanic and White. Innovation R&D activity is based on unedited company responses to innovation questions, not R&D expenditures. 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.

TABLE 54

**Companies that reported business process innovation by industry and innovation R&D activity: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovation R&D activity			
			Number		Percent	
			Yes	No	Yes	No
All industries	11, 21–23, 31–33, 42–81	929,754	262,972	666,783	28.3	71.7
Manufacturing industries	31–33	57,775	28,057	29,717	48.6	51.4
Food	311	5,396	2,344	3,051	43.4	56.6
Beverage and tobacco products	312	2,624	1,526	1,099	58.1	41.9
Textile, apparel, and leather products	313–16	2,451	984	1,466	40.1	59.9
Wood products	321	2,102	727	1,376	34.6	65.4
Paper	322	631	221	408	35.2	64.8
Printing and related support activities	323	4,814	1,257	3,556	26.1	73.9
Petroleum and coal products	324	163	104	59	63.8	36.2
Chemicals	325	2,459	1,788	670	72.8	27.2
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	200	119	80	60.0	40.0
Pharmaceuticals and medicines	3254	536	385	150	72.0	28.0
Soap, cleaning compound, and toilet preparation manufacturing	3256	531	390	140	73.6	26.4
Other chemicals	other 325	1,193	895	299	74.9	25.1
Plastics and rubber products	326	2,554	1,318	1,237	51.6	48.4
Nonmetallic mineral products	327	1,634	575	1,058	35.2	64.8
Primary metals	331	699	244	456	34.9	65.1
Fabricated metal products	332	11,797	5,601	6,197	47.5	52.5
Machinery	333	5,821	3,694	2,126	63.5	36.5
Computer and electronic products	334	2,902	2,036	865	70.2	29.8
Communications equipment	3342	370	291	78	78.9	21.1
Semiconductor and other electronic components	3344	990	581	409	58.7	41.3
Navigational, measuring, electromedical, and control instruments	3345	1,177	938	240	79.6	20.4
Other computer and electronic products	other 334	367	229	137	62.7	37.3
Electrical equipment, appliances, and components	335	1,222	814	409	66.5	33.5
Transportation equipment	336	1,793	1,073	721	59.8	40.2
Automobiles, bodies, trailers, and parts	3361–63	1,107	643	463	58.2	41.8
Aerospace products and parts	3364	264	190	75	71.6	28.4
Other transportation	other 336	424	242	181	57.3	42.7
Furniture and related products	337	2,867	1,093	1,775	38.1	61.9
Miscellaneous	339	5,835	2,659	3,176	45.6	54.4
Medical equipment and supplies	3391	2,449	1,148	1,302	46.9	53.1
Other miscellaneous manufacturing	3399	3,387	1,513	1,873	44.7	55.3
Nonmanufacturing industries	11, 21–23, 42–81	871,980	234,914	637,064	26.9	73.1
Agriculture, forestry, fishing, and hunting	11	2,812	444	2,369	15.8	84.2
Mining, extraction, and support activities	21	1,323	211	1,113	15.9	84.1
Utilities	22	437	96	340	22.0	78.0
Construction	23	84,810	19,303	65,506	22.8	77.2
Wholesale trade	42	61,477	19,333	42,144	31.4	68.6
Retail trade	44–45	115,299	27,813	87,487	24.1	75.9
Transportation and warehousing	48–49	32,288	4,614	27,673	14.3	85.7
Information	51	17,517	9,002	8,513	51.4	48.6
Publishing	511	5,632	3,337	2,293	59.3	40.7
Newspaper, periodical, book, and directory publishers	5111	2,154	770	1,383	35.7	64.3
Software publishers	5112	3,477	2,566	912	73.8	26.2



TABLE 54

**Companies that reported business process innovation by industry and innovation R&D activity: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovation R&D activity			
			Number		Percent	
			Yes	No	Yes	No
Telecommunications	517	1,984	722	1,263	36.4	63.6
Data processing, hosting, and related services	518	3,256	2,023	1,232	62.2	37.8
Other information	other 51	6,646	2,921	3,726	44.0	56.0
Finance and insurance	52	39,923	10,190	29,733	25.5	74.5
Real estate and rental and leasing	53	38,262	6,916	31,347	18.1	81.9
Lessors of nonfinancial intangible assets (except copyrighted works)	533	257	145	113	56.0	44.0
Other real estate and rental and leasing	other 53	38,004	6,772	31,234	17.8	82.2
Professional, scientific, and technical services	54	150,463	56,759	93,704	37.7	62.3
Legal services	5411	18,535	3,857	14,679	20.8	79.2
Accounting, tax preparation, bookkeeping, and payroll services	5412	17,647	2,743	14,905	15.5	84.5
Architectural, engineering, and related services	5413	17,819	7,550	10,270	42.4	57.6
Specialized design services	5414	5,774	2,391	3,384	41.4	58.6
Computer systems design and related services	5415	33,191	17,125	16,067	51.6	48.4
Management, scientific, and technical consulting services	5416	34,721	14,290	20,430	41.2	58.8
Scientific research and development services	5417	2,974	2,559	416	86.0	14.0
Advertising, public relations, and related services	5418	7,126	2,338	4,787	32.8	67.2
Other professional, scientific, and technical services	5419	12,678	3,908	8,769	30.8	69.2
Management of companies and enterprises	55	414	151	264	36.5	63.5
Administrative and support and waste management and remediation services	56	53,717	13,082	40,634	24.4	75.6
Educational services	61	14,568	5,560	9,009	38.2	61.8
Health care and social assistance	62	96,291	23,292	72,998	24.2	75.8
Health care services	621–23	83,166	19,326	63,841	23.2	76.8
Social assistance	624	13,124	3,966	9,156	30.2	69.8
Arts, entertainment, and recreation	71	14,559	4,551	10,009	31.3	68.7
Accommodation and food services	72	91,077	20,319	70,759	22.3	77.7
Other services	81	56,736	13,277	43,460	23.4	76.6

r = relative standard error &gt; 50%.

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. Innovation R&amp;D activity is based on unedited company responses to innovation questions, not R&amp;D expenditures. 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.

TABLE 55

**Companies that reported business process innovation, by size of company and innovation R&D activity: 2016–18**

(Number and percent)

Employment size	Companies (number)	Innovation R&D activity			
		Number		Percent	
		Yes	No	Yes	No
All companies	929,754	262,972	666,783	28.3	71.7
Micro companies					
1–4	440,470	123,315	317,154	28.0	72.0
5–9	203,963	56,055	147,908	27.5	72.5
Small companies					
10–19	132,998	37,187	95,810	28.0	72.0
20–49	96,530	26,952	69,577	27.9	72.1
Medium companies					
50–99	30,046	10,507	19,538	35.0	65.0
100–249	16,611	5,268	11,344	31.7	68.3
Large companies					
250–499	4,779	1,644	3,136	34.4	65.6
500–999	1,907	823	1,085	43.2	56.8
1,000–4,999	1,856	846	1,009	45.6	54.4
5,000–9,999	275	167	109	60.4	39.6
10,000–24,999	187	129	59	68.4	31.6
25,000 or more	136	80	55	59.6	40.4

**Note(s):**

Detail may not add to total because of rounding. Innovation R&D activity is based on unedited company responses to innovation questions, not R&D expenditures. 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.

TABLE 56

**Companies that reported business process innovation, by firm classification of sex and innovation R&D activity: 2016–18**

(Number and percent)

Sex of owners	Companies (number)	Innovation R&D activity			
		Number		Percent	
		Yes	No	Yes	No
All companies (sex of owner)	929,754	262,972	666,783	28.3	71.7
Female majority owned	204,862	55,036	149,827	26.9	73.1
Male majority owned	570,424	166,014	404,411	29.1	70.9
Equally owned by male and female	144,061	37,859	106,203	26.3	73.7
Unclassifiable	10,407	4,064	6,342	39.1	60.9

**Note(s):**

Detail may not add to total because of rounding. Innovation R&D activity is based on unedited company responses to innovation questions, not R&D expenditures. 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.

TABLE 57

**Companies that reported business process innovation, by firm classification of race and ethnicity and innovation R&D activity: 2016–18**

(Number and percent)

Race and ethnicity of owners	Companies (number)	Innovation R&D activity			
		Number		Percent	
		Yes	No	Yes	No
All companies (race and ethnicity)	929,754	262,972	666,783	28.3	71.7
Race					
White	776,165	216,004	560,162	27.8	72.2
Asian	116,019	34,573	81,445	29.8	70.2
Black or African American	22,331	6,699	15,633	30.0	70.0
American Indian or Alaska Native	4,978	1,593	3,385	32.0	68.0
Native Hawaiian or Other Pacific Islander	891	246	644	27.6	72.4
Ethnicity					
Hispanic or Latino	69,613	17,306	52,307	24.9	75.1
Equally Hispanic and not Hispanic	8,961	2,356	6,604	26.3	73.7
Not Hispanic	840,777	239,245	601,531	28.5	71.5
Minority status					
Minority	209,605	58,995	150,611	28.1	71.9
Black or African American, American Indian or Alaska Native, or Hispanic or Latino	93,243	24,372	68,872	26.1	73.9
Equally minority and nonminority	16,021	5,218	10,804	32.6	67.4
Nonminority	693,722	194,694	499,027	28.1	71.9
Unclassifiable	10,407	4,064	6,342	39.1	60.9

**Note(s):**

Detail may not add to total because of rounding. Companies may be included in one or more race and ethnicity category. Companies classified as "minority" are those companies classified as any race and ethnicity combination other than not Hispanic and White. Innovation R&D activity is based on unedited company responses to innovation questions, not R&D expenditures. 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.

TABLE 58

**Companies that reported product or business process innovation, by industry and innovation R&D activity: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovation R&D activity			
			Number		Percent	
			Yes	No	Yes	No
All industries	11, 21–23, 31–33, 42–81	1,428,609	296,661	1,131,948	20.8	79.2
Manufacturing industries	31–33	77,332	32,967	44,365	42.6	57.4
Food	311	7,298	2,759	4,539	37.8	62.2
Beverage and tobacco products	312	3,547	1,799	1,748	50.7	49.3
Textile, apparel, and leather products	313–16	3,493	1,095	2,398	31.3	68.7
Wood products	321	2,795	819	1,976	29.3	70.7
Paper	322	794	236	558	29.7	70.3
Printing and related support activities	323	6,752	1,406	5,346	20.8	79.2
Petroleum and coal products	324	177	107	70	60.5	39.5
Chemicals	325	3,087	2,072	1,015	67.1	32.9
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	233	135	98	57.9	42.1
Pharmaceuticals and medicines	3254	712	463	249	65.0	35.0
Soap, cleaning compound, and toilet preparation manufacturing	3256	673	453	220	67.3	32.7
Other chemicals	other 325	1,470	1,023	447	69.6	30.4
Plastics and rubber products	326	3,420	1,638	1,782	47.9	52.1
Nonmetallic mineral products	327	2,328	667	1,661	28.7	71.3
Primary metals	331	871	291	580	33.4	66.6
Fabricated metal products	332	15,013	6,186	8,827	41.2	58.8
Machinery	333	7,256	4,404	2,852	60.7	39.3
Computer and electronic products	334	4,366	2,845	1,521	65.2	34.8
Communications equipment	3342	516	383	133	74.2	25.8
Semiconductor and other electronic components	3344	1,286	731	555	56.8	43.2
Navigational, measuring, electromedical, and control instruments	3345	1,952	1,389	563	71.2	28.8
Other computer and electronic products	other 334	612	342	270	55.9	44.1
Electrical equipment, appliances, and components	335	1,745	1,122	623	64.3	35.7
Transportation equipment	336	2,450	1,275	1,175	52.0	48.0
Automobiles, bodies, trailers, and parts	3361–63	1,531	764	767	49.9	50.1
Aerospace products and parts	3364	370	233	137	63.0	37.0
Other transportation	other 336	549	279	270	50.8	49.2
Furniture and related products	337	3,747	1,210	2,537	32.3	67.7
Miscellaneous	339	8,187	3,039	5,148	37.1	62.9
Medical equipment and supplies	3391	3,197	1,241	1,956	38.8	61.2
Other miscellaneous manufacturing	3399	4,991	1,799	3,192	36.0	64.0
Nonmanufacturing industries	11, 21–23, 42–81	1,351,279	263,693	1,087,586	19.5	80.5
Agriculture, forestry, fishing, and hunting	11	4,516	581	3,935	12.9	87.1
Mining, extraction, and support activities	21	2,470	282	2,188	11.4	88.6
Utilities	22	629	105	524	16.7	83.3
Construction	23	129,921	20,457	109,464	15.7	84.3
Wholesale trade	42	86,560	22,100	64,460	25.5	74.5
Retail trade	44–45	170,389	30,649	139,740	18.0	82.0
Transportation and warehousing	48–49	42,151	4,722	37,429	11.2	88.8
Information	51	24,362	10,255	14,107	42.1	57.9
Publishing	511	7,422	3,860	3,562	52.0	48.0
Newspaper, periodical, book, and directory publishers	5111	3,066	847	2,219	27.6	72.4
Software publishers	5112	4,355	3,010	1,345	69.1	30.9

TABLE 58

**Companies that reported product or business process innovation, by industry and innovation R&D activity: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Innovation R&D activity			
			Number		Percent	
			Yes	No	Yes	No
Telecommunications	517	2,615	748	1,867	28.6	71.4
Data processing, hosting, and related services	518	4,098	2,246	1,852	54.8	45.2
Other information	other 51	10,229	3,405	6,824	33.3	66.7
Finance and insurance	52	74,353	11,083	63,270	14.9	85.1
Real estate and rental and leasing	53	66,657	7,877	58,780	11.8	88.2
Lessors of nonfinancial intangible assets (except copyrighted works)	533	410	201	209	r 49.0	51.0
Other real estate and rental and leasing	other 53	66,245	7,676	58,569	11.6	88.4
Professional, scientific, and technical services	54	240,310	66,087	174,223	27.5	72.5
Legal services	5411	36,852	4,566	32,286	12.4	87.6
Accounting, tax preparation, bookkeeping, and payroll services	5412	32,911	3,060	29,851	9.3	90.7
Architectural, engineering, and related services	5413	29,705	9,505	20,200	32.0	68.0
Specialized design services	5414	8,545	2,631	5,914	30.8	69.2
Computer systems design and related services	5415	45,311	19,727	25,584	43.5	56.5
Management, scientific, and technical consulting services	5416	53,584	16,083	37,501	30.0	70.0
Scientific research and development services	5417	3,994	3,179	815	79.6	20.4
Advertising, public relations, and related services	5418	10,365	2,770	7,595	26.7	73.3
Other professional, scientific, and technical services	5419	19,044	4,568	14,476	24.0	76.0
Management of companies and enterprises	55	501	151	350	30.1	69.9
Administrative and support and waste management and remediation services	56	83,631	14,445	69,186	17.3	82.7
Educational services	61	22,242	6,421	15,821	28.9	71.1
Health care and social assistance	62	158,675	26,403	132,272	16.6	83.4
Health care services	621–23	137,145	22,189	114,956	16.2	83.8
Social assistance	624	21,529	4,214	17,315	19.6	80.4
Arts, entertainment, and recreation	71	26,345	5,361	20,984	20.3	79.7
Accommodation and food services	72	127,292	21,885	105,407	17.2	82.8
Other services	81	90,273	14,830	75,443	16.4	83.6

r = relative standard error &gt; 50%.

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. Innovation R&amp;D activity is based on unedited company responses to innovation questions, not R&amp;D expenditures. 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.

TABLE 59

**Companies that reported product or business process innovation, by size of company and innovation R&D activity: 2016–18**

(Number and percent)

Employment size	Companies (number)	Innovation R&D activity			
		Number		Percent	
		Yes	No	Yes	No
All companies	1,428,609	296,661	1,131,948	20.8	79.2
Micro companies					
1–4	745,109	140,794	604,315	18.9	81.1
5–9	295,942	61,416	234,526	20.8	79.2
Small companies					
10–19	185,636	41,815	143,821	22.5	77.5
20–49	129,014	30,394	98,620	23.6	76.4
Medium companies					
50–99	39,093	11,498	27,595	29.4	70.6
100–249	21,658	6,299	15,359	29.1	70.9
Large companies					
250–499	6,468	1,984	4,484	30.7	69.3
500–999	2,499	1,007	1,492	40.3	59.7
1,000–4,999	2,442	1,007	1,435	41.2	58.8
5,000–9,999	354	203	151	57.3	42.7
10,000–24,999	232	147	85	63.4	36.6
25,000 or more	167	97	70	58.1	41.9

**Note(s):**

Detail may not add to total because of rounding. Innovation R&D activity is based on unedited company responses to innovation questions, not R&D expenditures. 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.

TABLE 60

**Companies that reported product or business process innovation, by firm classification of sex and innovation R&D activity: 2016–18**

(Number and percent)

Sex of owners	Companies (number)	Innovation R&D activity					
		Number			Percent		
		Yes	No	Yes	No		
All companies (sex of owner)	1,428,609	296,661	1,131,948	20.8	79.2		
Female majority owned	313,833	61,574	252,259	19.6	80.4		
Male majority owned	883,701	187,591	696,110	21.2	78.8		
Equally owned by male and female	217,798	42,486	175,312	19.5	80.5		
Unclassifiable	13,279	5,008	8,271	37.7	62.3		

**Note(s):**

Detail may not add to total because of rounding. Innovation R&D activity is based on unedited company responses to innovation questions, not R&D expenditures. 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.



TABLE 61

**Companies that reported product or business process innovation, by firm classification of race and ethnicity and innovation R&D activity: 2016–18**

(Number and percent)

Race and ethnicity of owners	Companies (number)	Innovation R&D activity			
		Number		Percent	
		Yes	No	Yes	No
All companies (race and ethnicity)	1,428,609	296,661	1,131,948	20.8	79.2
Race					
White	1,200,084	245,125	954,959	20.4	79.6
Asian	175,828	37,355	138,473	21.2	78.8
Black or African American	32,606	7,151	25,455	21.9	78.1
American Indian or Alaska Native	6,760	1,671	5,089	24.7	75.3
Native Hawaiian or Other Pacific Islander	1,412	247	1,165	17.5	82.5
Ethnicity					
Hispanic or Latino	98,245	18,610	79,635	18.9	81.1
Equally Hispanic and not Hispanic	13,972	2,559	11,413	18.3	81.7
Not Hispanic	1,303,116	270,482	1,032,634	20.8	79.2
Minority status					
Minority	309,153	63,653	245,500	20.6	79.4
Black or African American, American Indian or Alaska Native, or Hispanic or Latino	132,508	26,144	106,364	19.7	80.3
Equally minority and nonminority	23,872	5,872	18,000	24.6	75.4
Nonminority	1,082,306	222,125	860,181	20.5	79.5
Unclassifiable	13,279	5,008	8,271	37.7	62.3

**Note(s):**

Detail may not add to total because of rounding. Companies may be included in one or more race and ethnicity category. Companies classified as "minority" are those companies classified as any race and ethnicity combination other than not Hispanic and White. Innovation R&D activity is based on unedited company responses to innovation questions, not R&D expenditures. 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.

TABLE 62

**Companies with product or business process innovation activities, by company size: 2016–18**

(Number and percent)

Innovation activity	All companies	Micro companies (1–9 employees)	Small companies (10–49 employees)	Medium companies (50–249 employees)	Large companies (250+ employees)
All companies with product or process innovation activities (count of companies)	1,428,609	1,041,050	314,648	60,750	12,160
Activities (count of companies)					
Research and development	296,661	202,209	72,208	17,798	4,445
Engineering and design	251,020	165,417	64,213	16,526	4,863
Marketing and brand equity	407,945	276,005	103,472	23,193	5,276
Intellectual property	166,333	111,384	40,924	10,842	3,186
Employee training	501,045	313,146	148,608	31,868	7,427
Software development and database activities	323,067	206,729	86,925	23,168	6,248
Acquisition of machinery, equipment and other tangible assets	472,057	301,692	135,488	28,789	6,089
Management related to innovation	329,160	211,152	91,158	21,354	5,495
Activities (percent)					
Research and development	20.8	19.4	22.9	29.3	36.6
Engineering and design	17.6	15.9	20.4	27.2	40.0
Marketing and brand equity	28.6	26.5	32.9	38.2	43.4
Intellectual property	11.6	10.7	13.0	17.8	26.2
Employee training	35.1	30.1	47.2	52.5	61.1
Software development and database activities	22.6	19.9	27.6	38.1	51.4
Acquisition of machinery, equipment and other tangible assets	33.0	29.0	43.1	47.4	50.1
Management related to innovation	23.0	20.3	29.0	35.2	45.2

**Note(s):**

Detail by size category may not add to total because of rounding. Companies may be counted in zero, one, or more innovation activity categories. 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.

TABLE 63

**Companies with new-to-market product innovation, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Product innovation new to market			
			Number		Percent	
			Yes	No	Yes	No
All industries	11, 21–23, 31–33, 42–81	4,805,151	183,648	4,621,503	3.8	96.2
Manufacturing industries	31–33	217,565	18,181	199,384	8.4	91.6
Food	311	18,250	1,602	16,648	8.8	91.2
Beverage and tobacco products	312	7,723	858	6,865	11.1	88.9
Textile, apparel, and leather products	313–16	10,554	738	9,816	7.0	93.0
Wood products	321	11,012	416	10,596	3.8	96.2
Paper	322	2,117	158 r	1,959	7.5 r	92.5
Printing and related support activities	323	20,851	701	20,150	3.4	96.6
Petroleum and coal products	324	583	41 r	542	7.0 r	93.0
Chemicals	325	7,522	1,021	6,501	13.6	86.4
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	52	541	8.8	91.2
Pharmaceuticals and medicines	3254	1,365	219	1,146	16.0	84.0
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	236	1,400	14.4	85.6
Other chemicals	other 325	3,927	514	3,413	13.1	86.9
Plastics and rubber products	326	8,087	1,045	7,042	12.9	87.1
Nonmetallic mineral products	327	7,749	435	7,314	5.6	94.4
Primary metals	331	2,537	111	2,426	4.4	95.6
Fabricated metal products	332	48,472	2,452	46,020	5.1	94.9
Machinery	333	18,558	2,555	16,003	13.8	86.2
Computer and electronic products	334	9,036	1,815	7,221	20.1	79.9
Communications equipment	3342	974	251	723	25.8	74.2
Semiconductor and other electronic components	3344	2,796	452	2,344	16.2	83.8
Navigational, measuring, electromedical, and control instruments	3345	3,909	882	3,027	22.6	77.4
Other computer and electronic products	other 334	1,359	230	1,129	16.9	83.1
Electrical equipment, appliances, and components	335	4,000	690	3,310	17.3	82.8
Transportation equipment	336	7,175	780	6,395	10.9	89.1
Automobiles, bodies, trailers, and parts	3361–63	4,565	531	4,034	11.6	88.4
Aerospace products and parts	3364	985	132	853	13.4	86.6
Other transportation	other 336	1,625	117	1,508	7.2	92.8
Furniture and related products	337	12,647	684	11,963	5.4	94.6
Miscellaneous	339	20,669	2,069	18,600	10.0	90.0
Medical equipment and supplies	3391	8,060	724	7,336	9.0	91.0
Other miscellaneous manufacturing	3399	12,608	1,346	11,262	10.7	89.3
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	165,466	4,422,120	3.6	96.4
Agriculture, forestry, fishing, and hunting	11	21,606	192	21,414	0.9	99.1
Mining, extraction, and support activities	21	14,969	206	14,763	1.4 r	98.6
Utilities	22	2,684	32	2,652	1.2	98.8
Construction	23	613,110	11,612	601,498	1.9	98.1
Wholesale trade	42	257,153	21,354	235,799	8.3	91.7
Retail trade	44–45	560,952	29,593	531,359	5.3	94.7
Transportation and warehousing	48–49	152,463	2,314	150,149	1.5	98.5
Information	51	61,638	5,729	55,909	9.3	90.7
Publishing	511	17,590	2,302	15,288	13.1	86.9
Newspaper, periodical, book, and directory publishers	5111	9,761	688	9,073	7.0	93.0
Software publishers	5112	7,828	1,615	6,213	20.6	79.4

TABLE 63

**Companies with new-to-market product innovation, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Product innovation new to market			
			Number		Percent	
			Yes	No	Yes	No
Telecommunications	517	7,164	624	6,540	8.7	91.3
Data processing, hosting, and related services	518	8,918	1,242	7,676	13.9	86.1
Other information	other 51	27,965	1,561	26,404	5.6	94.4
Finance and insurance	52	200,857	5,732	195,125	2.9	97.1
Real estate and rental and leasing	53	255,783	2,559	253,224	1.0	99.0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	0	1,812	0.0	100.0
Other real estate and rental and leasing	other 53	253,970	2,559	251,411	1.0	99.0
Professional, scientific, and technical services	54	695,672	30,666	665,006	4.4	95.6
Legal services	5411	152,243	810	151,433	0.5	99.5
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	1,022	105,612	1.0	99.0
Architectural, engineering, and related services	5413	88,491	4,243	84,248	4.8	95.2
Specialized design services	5414	26,282	922	25,360	3.5	96.5
Computer systems design and related services	5415	95,950	9,735	86,215	10.1	89.9
Management, scientific, and technical consulting services	5416	132,989	8,185	124,804	6.2	93.8
Scientific research and development services	5417	9,798	1,751	8,047	17.9	82.1
Advertising, public relations, and related services	5418	27,677	1,472	26,205	5.3	94.7
Other professional, scientific, and technical services	5419	55,569	2,531	53,038	4.6	95.4
Management of companies and enterprises	55	2,409	155 r	2,254	6.4	93.6
Administrative and support and waste management and remediation services	56	287,807	6,730	281,077	2.3	97.7
Educational services	61	53,912	3,930	49,982	7.3	92.7
Health care and social assistance	62	519,556	14,489	505,067	2.8	97.2
Health care services	621–23	459,855	12,759	447,096	2.8	97.2
Social assistance	624	59,700	1,729	57,971	2.9	97.1
Arts, entertainment, and recreation	71	88,831	4,637	84,194	5.2	94.8
Accommodation and food services	72	453,059	15,550	437,509	3.4	96.6
Other services	81	345,125	9,989	335,136	2.9	97.1

r = relative standard error &gt; 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.

TABLE 64

**Companies with new-to-market product innovation, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	Product innovation new to market			
		Number		Percent	
		Yes	No	Yes	No
All companies	4,805,151	183,648	4,621,503	3.8	96.2
Micro companies					
1–4	2,667,724	88,670	2,579,054	3.3	96.7
5–9	936,576	42,354	894,222	4.5	95.5
Small companies					
10–19	579,513	26,384	553,129	4.6	95.4
20–49	402,199	16,200	385,999	4.0	96.0
Medium companies					
50–99	119,497	5,387	114,110	4.5	95.5
100–249	65,565	2,587	62,978	3.9	96.1
Large companies					
250–499	18,897	921	17,976	4.9	95.1
500–999	7,289	450	6,839	6.2	93.8
1,000–4,999	6,199	410	5,789	6.6	93.4
5,000–9,999	823	137	686	16.6	83.4
10,000–24,999	514	88	426	17.1	82.9
25,000 or more	358	56	302	15.6	84.4

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 65

**Companies with new-to-market product innovation, by innovation R&D activity: 2016–18**

(Number and percent)

R&D activity	Companies (number)	Product innovation new to market			
		Number		Percent	
		Yes	No	Yes	No
All companies	4,805,151	183,648	4,621,503	3.8	96.2
R&D-active companies	300,921	89,904	211,017	29.9	70.1
Non-R&D-active companies	4,504,231	93,744	4,410,487	2.1	97.9

**Note(s):**

Detail may not add to total because of rounding. Innovation R&D activity is based on unedited company responses to innovation questions, not R&D expenditures. 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.

TABLE 66

## Companies with new-to-the-business product innovation, by industry: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	Product innovation only new to the business			
			Number		Percent	
			Yes	No	Yes	No
All industries	11, 21–23, 31–33, 42–81	4,805,151	355,669	4,449,482	7.4	92.6
Manufacturing industries	31–33	217,565	25,816	191,749	11.9	88.1
Food	311	18,250	2,300	15,950	12.6	87.4
Beverage and tobacco products	312	7,723	1,580	6,143	20.5	79.5
Textile, apparel, and leather products	313–16	10,554	1,037	9,517	9.8	90.2
Wood products	321	11,012	757	10,255	6.9	93.1
Paper	322	2,117	242	1,875	11.4	88.6
Printing and related support activities	323	20,851	2,371	18,480	11.4	88.6
Petroleum and coal products	324	583	43	540	7.4	92.6
Chemicals	325	7,522	1,332	6,190	17.7	82.3
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	94	499	15.9	84.1
Pharmaceuticals and medicines	3254	1,365	331	1,034	24.2	75.8
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	334	1,302	20.4	79.6
Other chemicals	other 325	3,927	574	3,353	14.6	85.4
Plastics and rubber products	326	8,087	1,186	6,901	14.7	85.3
Nonmetallic mineral products	327	7,749	637	7,112	8.2	91.8
Primary metals	331	2,537	165	2,372	6.5	93.5
Fabricated metal products	332	48,472	3,530	44,942	7.3	92.7
Machinery	333	18,558	3,201	15,357	17.2	82.8
Computer and electronic products	334	9,036	1,712	7,324	18.9	81.1
Communications equipment	3342	974	243	731	24.9	75.1
Semiconductor and other electronic components	3344	2,796	424	2,372	15.2	84.8
Navigational, measuring, electromedical, and control instruments	3345	3,909	758	3,151	19.4	80.6
Other computer and electronic products	other 334	1,359	289	1,070	21.3	78.7
Electrical equipment, appliances, and components	335	4,000	718	3,282	18.0	82.1
Transportation equipment	336	7,175	998	6,177	13.9	86.1
Automobiles, bodies, trailers, and parts	3361–63	4,565	639	3,926	14.0	86.0
Aerospace products and parts	3364	985	142	843	14.4	85.6
Other transportation	other 336	1,625	216	1,409	13.3	86.7
Furniture and related products	337	12,647	1,048	11,599	8.3	91.7
Miscellaneous	339	20,669	2,959	17,710	14.3	85.7
Medical equipment and supplies	3391	8,060	1,257	6,803	15.6	84.4
Other miscellaneous manufacturing	3399	12,608	1,701	10,907	13.5	86.5
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	329,853	4,257,733	7.2	92.8
Agriculture, forestry, fishing, and hunting	11	21,606	1,045	20,561	4.8	95.2
Mining, extraction, and support activities	21	14,969	361	14,608	2.4	97.6
Utilities	22	2,684	147	2,537	5.5	94.5
Construction	23	613,110	23,426	589,684	3.8	96.2
Wholesale trade	42	257,153	28,205	228,948	11.0	89.0
Retail trade	44–45	560,952	48,178	512,774	8.6	91.4
Transportation and warehousing	48–49	152,463	5,635	146,828	3.7	96.3
Information	51	61,638	9,298	52,340	15.1	84.9
Publishing	511	17,590	3,101	14,489	17.6	82.4
Newspaper, periodical, book, and directory publishers	5111	9,761	1,033	8,728	10.6	89.4

TABLE 66

**Companies with new-to-the-business product innovation, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Product innovation only new to the business			
			Number		Percent	
			Yes	No	Yes	No
Software publishers	5112	7,828	2,068	5,760	26.4	73.6
Telecommunications	517	7,164	1,024	6,140	14.3	85.7
Data processing, hosting, and related services	518	8,918	1,841	7,077	20.6	79.4
Other information	other 51	27,965	3,333	24,632	11.9	88.1
Finance and insurance	52	200,857	17,380	183,477	8.7	91.3
Real estate and rental and leasing	53	255,783	11,535	244,248	4.5	95.5
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	254	1,558	14.0	r 86.0
Other real estate and rental and leasing	other 53	253,970	11,281	242,689	4.4	95.6
Professional, scientific, and technical services	54	695,672	65,141	630,531	9.4	90.6
Legal services	5411	152,243	5,013	147,230	3.3	96.7
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	4,739	101,895	4.4	95.6
Architectural, engineering, and related services	5413	88,491	8,222	80,269	9.3	90.7
Specialized design services	5414	26,282	2,516	23,766	9.6	90.4
Computer systems design and related services	5415	95,950	17,633	78,317	18.4	81.6
Management, scientific, and technical consulting services	5416	132,989	16,489	116,500	12.4	87.6
Scientific research and development services	5417	9,798	1,208	8,590	12.3	87.7
Advertising, public relations, and related services	5418	27,677	3,250	24,427	11.7	88.3
Other professional, scientific, and technical services	5419	55,569	6,069	49,500	10.9	89.1
Management of companies and enterprises	55	2,409	189	2,220	7.8	92.2
Administrative and support and waste management and remediation services	56	287,807	17,605	270,202	6.1	93.9
Educational services	61	53,912	7,713	46,199	14.3	85.7
Health care and social assistance	62	519,556	37,976	481,580	7.3	92.7
Health care services	621–23	459,855	32,614	427,241	7.1	92.9
Social assistance	624	59,700	5,363	54,337	9.0	91.0
Arts, entertainment, and recreation	71	88,831	7,161	81,670	8.1	91.9
Accommodation and food services	72	453,059	26,669	426,390	5.9	94.1
Other services	81	345,125	22,198	322,927	6.4	93.6

r = relative standard error &gt; 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.



TABLE 67

**Companies with new-to-the-business product innovation, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	Product innovation only new to the business			
		Number		Percent	
		Yes	No	Yes	No
All companies	4,805,151	355,669	4,449,482	7.4	92.6
Micro companies					
1–4	2,667,724	181,481	2,486,243	6.8	93.2
5–9	936,576	78,610	857,966	8.4	91.6
Small companies					
10–19	579,513	46,951	532,562	8.1	91.9
20–49	402,199	29,629	372,570	7.4	92.6
Medium companies					
50–99	119,497	9,722	109,775	8.1	91.9
100–249	65,565	5,625	59,940	8.6	91.4
Large companies					
250–499	18,897	1,599	17,298	8.5	91.5
500–999	7,289	895	6,394	12.3	87.7
1,000–4,999	6,199	812	5,387	13.1	86.9
5,000–9,999	823	142	681	17.3	82.7
10,000–24,999	514	131	383	25.5	74.5
25,000 or more	358	79	279	22.1	77.9

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 68

**Companies with new-to-the-business product innovation, by innovation R&D activity: 2016–18**

(Number and percent)

R&D activity	Companies (number)	Product innovation only new to the business			
		Number		Percent	
		Yes	No	Yes	No
All companies	4,805,151	355,669	4,449,482	7.4	92.6
R&D-active companies	300,921	124,277	176,644	41.3	58.7
Non-R&D-active companies	4,504,231	231,392	4,272,839	5.1	94.9

**Note(s):**

Detail may not add to total because of rounding. Innovation R&D activity is based on unedited company responses to innovation questions, not R&D expenditures. 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.

TABLE 69

**Total innovation activity costs, by industry and employment size: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	All companies	1–9 employees	10–49 employees	50–249 employees	250 or more employees
All industries	11, 21–23, 31–33, 42–81	10,410,721,013	3,326,230,291	2,241,310,703	1,861,490,039	2,981,689,980
Manufacturing industries	31–33	950,038,837	140,279,527	355,906,697	56,138,307	397,714,305
Food	311	26,166,899	1,455,329	12,274,963	6,473,232	5,963,376
Beverage and tobacco products	312	10,567,323	3,687,138	6,705,244	123,507	51,435
Textile, apparel, and leather products	313–16	5,418,845	4,537,450	73,365	189,522	618,507
Wood products	321	9,794,821	1,769,236	1,800,327	5,567,212	658,046
Paper	322	5,619,670	17,436	122,855	254,905	5,224,473
Printing and related support activities	323	42,430,316	7,232,452	2,908,000	5,387,083	26,902,780
Petroleum and coal products	324	690,395	302,934	267,998	6,229	113,234
Chemicals	325	85,246,593	1,626,809	9,674,074	8,590,875	65,354,835
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	451,514	13,818	219,123	104,830	113,742
Pharmaceuticals and medicines	3254	43,313,870	1,199,513	282,709	4,293,995	37,537,652
Soap, cleaning compound, and toilet preparation manufacturing	3256	3,090,778	267,111	308,983	61,721	2,452,963
Other chemicals	other 325	38,390,432	146,367	8,863,258	4,130,329	25,250,478
Plastics and rubber products	326	26,727,421	5,959,625	2,576,446	889,199	17,302,151
Nonmetallic mineral products	327	9,981,429	697,932	4,997,901	306,388	3,979,208
Primary metals	331	14,305,756	320,599	11,076,016	147,534	2,761,607
Fabricated metal products	332	124,742,723	54,894,945	59,159,074	7,697,137	2,991,567
Machinery	333	249,454,593	24,517,982	188,769,858	3,878,075	32,288,678
Computer and electronic products	334	58,694,742	12,818,610	7,857,637	6,102,024	31,916,471
Communications equipment	3342	7,036,718	2,519,425	62,016	3,543,065	912,212
Semiconductor and other electronic components	3344	31,483,799	419,104	5,135,882	1,643,049	24,285,764
Navigational, measuring, electromedical, and control instruments	3345	18,224,322	9,349,800	2,103,105	806,952	5,964,466
Other computer and electronic products	other 334	1,949,903	530,282	556,633	108,958	754,030
Electrical equipment, appliances, and components	335	18,949,956	7,012,290	4,760,664	2,987,939	4,189,063
Transportation equipment	336	203,739,986	4,990,536	25,321,311	2,826,135	170,602,004
Automobiles, bodies, trailers, and parts	3361–63	189,457,462	3,549,500	24,845,910	2,471,036	158,591,016
Aerospace products and parts	3364	13,187,515	1,369,653	316,937	265,793	11,235,132
Other transportation	other 336	1,095,009	71,383	158,464	89,306	775,856
Furniture and related products	337	6,845,665	1,285,603	633,500	4,159,882	766,681
Miscellaneous	339	50,661,599	7,152,515	16,927,464	551,428	26,030,191
Medical equipment and supplies	3391	33,704,720	6,755,747	1,205,425	174,948	25,568,600
Other miscellaneous manufacturing	3399	16,956,879	396,768	15,722,039	376,480	461,591
Nonmanufacturing industries	11, 21–23, 42–81	9,460,682,176	3,185,950,764	1,885,404,006	1,805,351,732	2,583,975,675

TABLE 69

**Total innovation activity costs, by industry and employment size: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	All companies	1–9 employees	10–49 employees	50–249 employees	250 or more employees
Agriculture, forestry, fishing, and hunting	11	1,145,527,199 r	10,154,686 r	1,081,460 r	264,403 r	1,134,026,651 r
Mining, extraction, and support activities	21	16,507,354	6,257,061 r	1,290,134	877,466	8,082,693
Utilities	22	740,036,775 r	1,605,343	237,153	736,655,764 r	1,538,515
Construction	23	832,952,781	342,170,152	394,993,804	92,760,288 r	3,028,536
Wholesale trade	42	746,011,242	349,247,150	135,996,709	167,799,499 r	92,967,885
Retail trade	44–45	517,493,969	189,530,156	229,652,897 r	51,898,731 r	46,412,186
Transportation and warehousing	48–49	247,431,425	130,935,545	69,985,408 r	8,451,459	38,059,014
Information	51	737,537,478	130,440,515	25,531,940	14,932,851	566,632,173
Publishing	511	516,997,164	11,600,821	13,191,674 r	1,336,344	490,868,325
Newspaper, periodical, book, and directory publishers	5111	19,848,831	981,581	1,064,011 r	43,018	17,760,222
Software publishers	5112	497,148,333	10,619,241	12,127,663 r	1,293,326	473,108,103
Telecommunications	517	80,153,644	13,475,812 r	3,741,469	4,964,043	57,972,319
Data processing, hosting, and related services	518	48,729,296	29,197,439 r	6,981,008	8,051,373 r	4,499,477
Other information	other 51	91,657,374 r	76,166,442 r	1,617,788	581,092	13,292,052
Finance and insurance	52	809,192,265	319,732,839 r	81,108,945 r	321,364,790 r	86,985,691
Real estate and rental and leasing	53	122,514,458	51,771,753	70,318,066 r	296,847 r	127,792
Lessors of nonfinancial intangible assets (except copyrighted works)	533	69,355	36,555 r	16,827 r	0	D
Other real estate and rental and leasing	other 53	122,445,103	51,735,199	70,301,238 r	296,847 r	111,819
Professional, scientific, and technical services	54	1,621,308,104	739,906,557	281,566,717	270,487,109 r	329,347,721
Legal services	5411	129,002,283	61,252,560	2,437,108	31,445,001 r	33,867,615
Accounting, tax preparation, bookkeeping, and payroll services	5412	31,968,606	14,715,645	1,841,956 r	2,726,327 r	12,684,679
Architectural, engineering, and related services	5413	484,431,724	65,542,642	159,518,776 r	27,584,524 r	231,785,782
Specialized design services	5414	13,146,641 r	12,914,145 r	230,779 r	1,718 r	0
Computer systems design and related services	5415	619,947,900	364,982,314	69,487,803 r	164,582,653 r	20,895,130
Management, scientific, and technical consulting services	5416	118,559,666	104,655,204	10,168,482 r	2,182,901	1,553,078
Scientific research and development services	5417	128,486,829	85,729,929 r	14,242,432	2,892,217	25,622,251
Advertising, public relations, and related services	5418	55,015,314	12,188,176	2,666,368	38,992,581	1,168,190
Other professional, scientific, and technical services	5419	40,749,141	17,925,943	20,973,014 r	79,188 r	1,770,996
Management of companies and enterprises	55	2,427,789 r	313,784 r	D	139,834 r	D
Administrative and support and waste management and remediation services	56	371,676,749	154,229,089	177,963,298	14,958,215 r	24,526,146
Educational services	61	27,814,328	14,435,458	12,209,208 r	77,937	1,091,725
Health care and social assistance	62	531,448,526	258,368,247	168,250,438	93,809,987 r	11,019,854

TABLE 69

**Total innovation activity costs, by industry and employment size: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	All companies	1–9 employees	10–49 employees	50–249 employees	250 or more employees
Health care services	621–23	388,227,856	200,551,960	152,014,990	24,877,126	10,783,781
Social assistance	624	143,220,670	57,816,287	16,235,448	68,932,861	236,073
Arts, entertainment, and recreation	71	395,015,208	261,415,511	10,837,776	7,057,507	115,704,414
Accommodation and food services	72	288,132,127	70,437,611	93,233,008	14,262,428	110,199,080
Other services	81	307,654,398	154,999,306	129,173,704	9,256,618	14,224,769

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. 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.

TABLE 70

## Innovation activity costs for R&amp;D, by industry and employment size: 2018

(Thousands of U.S. dollars)

Industry	NAICS code	All companies	1-9 employees	10-49 employees	50-249 employees	250 or more employees
All industries	11, 21-23, 31-33, 42-81	257,725,139	47,128	10,540,042	14,105,821	233,032,148
Manufacturing industries	31-33	84,504,901	13,256	2,265,853	5,546,151	76,679,641
Food	311	3,281,200	442	24,785	1,362,384	1,893,589
Beverage and tobacco products	312	76,747	D	31,230	34,474	11,017
Textile, apparel, and leather products	313-16	139,734	0	13,127	28,991	97,616
Wood products	321	181,550	0	2,697	7,466	171,388
Paper	322	3,861,578	0	13,092	38,438	3,810,047
Printing and related support activities	323	69,939	0	10,516	13,193	46,230
Petroleum and coal products	324	107,464	0	2,431	3,652	101,380
Chemicals	325	24,212,216	12,471	156,093	726,460	23,317,192
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	116,636	0	2,325	3,761	110,550
Pharmaceuticals and medicines	3254	19,263,226	D	40,566	204,177	19,006,076
Soap, cleaning compound, and toilet preparation manufacturing	3256	663,981	0	29,855	15,188	618,938
Other chemicals	other 325	4,168,373	D	83,347	503,334	3,581,628
Plastics and rubber products	326	2,151,255	0	70,018	286,097	1,795,140
Nonmetallic mineral products	327	243,501	D	41,672	21,353	180,442
Primary metals	331	512,612	0	36,810	51,853	423,949
Fabricated metal products	332	1,795,105	D	322,298	552,771	919,912
Machinery	333	12,658,977	0	959,269	1,211,933	10,487,775
Computer and electronic products	334	13,744,178	D	303,114	612,613	12,828,292
Communications equipment	3342	632,168	D	35,943	45,773	550,359
Semiconductor and other electronic components	3344	7,749,075	0	66,039	126,410	7,556,626
Navigational, measuring, electromedical, and control instruments	3345	4,941,659	D	170,250	391,586	4,379,756
Other computer and electronic products	other 334	421,276	0	30,881	48,844	341,551
Electrical equipment, appliances, and components	335	2,902,418	0	121,556	189,923	2,590,939
Transportation equipment	336	11,668,474	0	69,647	147,864	11,450,963
Automobiles, bodies, trailers, and parts	3361-63	3,063,831	0	23,806	85,479	2,954,546
Aerospace products and parts	3364	7,868,486	0	41,982	35,382	7,791,122
Other transportation	other 336	736,156	0	3,859	27,003	705,295
Furniture and related products	337	333,503	0	18,700	87,506	227,297
Miscellaneous	339	6,564,452	0	68,798	169,180	6,326,474
Medical equipment and supplies	3391	6,290,959	0	35,953	53,981	6,201,025
Other miscellaneous manufacturing	3399	273,493	0	32,845	115,199	125,449
Nonmanufacturing industries	11, 21-23, 42-81	173,220,238	33,872	8,274,189	8,559,670	156,352,507
Agriculture, forestry, fishing, and hunting	11	32,619	0	4,747	D	D
Mining, extraction, and support activities	21	1,369,924	0	6,727	11,083	1,352,114
Utilities	22	61,001	0	2,058	D	58,915
Construction	23	1,791,021	0	180,052	800,928	810,041
Wholesale trade	42	50,734,201	12,270	1,267,202	545,714	48,909,015
Retail trade	44-45	20,658,045	2,941	404,258	331,259	19,919,588
Transportation and warehousing	48-49	316,329	0	86,341	10,871	219,118
Information	51	47,870,290	D	1,067,450	1,611,602	45,188,740
Publishing	511	36,005,615	0	484,905	790,134	34,730,576

TABLE 70

**Innovation activity costs for R&D, by industry and employment size: 2018**

(Thousands of U.S. dollars)

Industry	NAICS code	All companies	1–9 employees	10–49 employees	50–249 employees	250 or more employees
Newspaper, periodical, book, and directory publishers	5111	41,593	0	17,274	5,994	D
Software publishers	5112	35,964,022	0	467,631	784,140	34,712,251
Telecommunications	517	3,131,490	0	21,940	67,048 r	3,042,502
Data processing, hosting, and related services	518	3,853,980	0	428,908	424,397	3,000,676
Other information	other 51	4,879,205	D	131,697 r	330,023	4,414,986
Finance and insurance	52	11,427,470	D	318,344 r	224,223 r	10,884,400
Real estate and rental and leasing	53	170,885	D	72,171 r	5,011 r	93,660
Lessors of nonfinancial intangible assets (except copyrighted works)	533	15,308	0	D	0	D
Other real estate and rental and leasing	other 53	155,577	D	70,794 r	5,011 r	79,729
Professional, scientific, and technical services	54	34,141,252	15,617 r	3,788,160	4,038,012	26,299,464
Legal services	5411	23,048	0	6,801 r	1,712	14,535
Accounting, tax preparation, bookkeeping, and payroll services	5412	87,894	0	14,607	9,102	64,185
Architectural, engineering, and related services	5413	1,991,585	D	642,287	764,093	585,130
Specialized design services	5414	31,674 r	D	30,999 r	D	0
Computer systems design and related services	5415	13,395,497	D	1,349,042	905,272	11,139,237
Management, scientific, and technical consulting services	5416	1,908,227	13,314 r	593,449	168,118	1,133,346
Scientific research and development services	5417	15,278,959	0	1,052,693	2,052,095	12,174,171
Advertising, public relations, and related services	5418	203,399	D	52,770	99,788	50,708 r
Other professional, scientific, and technical services	5419	1,220,970	0	45,511 r	37,308 r	1,138,152
Management of companies and enterprises	55	D	0	0	D	D
Administrative and support and waste management and remediation services	56	2,173,070	0	146,379	41,321	1,985,370
Educational services	61	67,525	0	23,691	6,614	37,220
Health care and social assistance	62	804,879 r	0	316,902	386,992 r	100,984
Health care services	621–23	717,384 r	0	253,224	365,575 r	98,586
Social assistance	624	87,495	0	63,679 r	21,418 r	2,398
Arts, entertainment, and recreation	71	18,843	0	15,182	2,551 r	D
Accommodation and food services	72	897,107	0	306,638	515,583 r	74,886
Other services	81	684,791	0	267,889 r	1,653 r	415,249

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

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 71-1

**Importance of intellectual property protection, by type: 2018**

(Number and percent)

Type of intellectual property	Companies (number)	Very important	Somewhat important	Not at all important
Utility patents (patents for inventions)	4,805,151	3.3	5.5	91.2
Design patents (patents for appearance)	4,805,151	3.6	6.3	90.0
Trademarks	4,805,151	7.9	10.3	81.8
Copyrights	4,805,151	7.1	9.3	83.6
Trade secrets	4,805,151	8.6	10.8	80.6
Nondisclosure agreements	4,805,151	10.2	13.0	76.8

**Note(s):**

Detail may not add to total because of rounding. 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.



TABLE 71-2

**Importance of intellectual property protection, by type, for companies with 1–9 employees: 2018**

(Number and percent)

Type of intellectual property	Companies (number)	Very important	Somewhat important	Not at all important
Utility patents (patents for inventions)	3,604,301	3.0	5.1	91.9
Design patents (patents for appearance)	3,604,301	3.2	5.8	91.0
Trademarks	3,604,301	6.6	9.3	84.1
Copyrights	3,604,301	6.5	8.5	85.0
Trade secrets	3,604,301	7.2	9.6	83.2
Nondisclosure agreements	3,604,301	8.7	11.7	79.6

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 71-3

**Importance of intellectual property protection, by type, for companies with 10 or more employees: 2018**

(Number and percent)

Type of intellectual property	Companies (number)	Very important	Somewhat important	Not at all important
Utility patents (patents for inventions)	1,200,849	4.3	6.8	88.9
Design patents (patents for appearance)	1,200,849	4.9	7.9	87.2
Trademarks	1,200,849	11.9	13.4	74.7
Copyrights	1,200,849	9.0	11.6	79.4
Trade secrets	1,200,849	13.0	14.2	72.8
Nondisclosure agreements	1,200,849	14.7	17.0	68.3

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 72

**Importance of utility patents, by industry: 2018**

(Number and percent)

Industry	NAICS code	Companies (number)	Very important	Somewhat important	Not at all important
All industries	11, 21–23, 31–33, 42–81	4,805,151	3.3	5.5	91.2
Manufacturing industries	31–33	217,565	8.7	9.8	81.5
Food	311	18,250	4.4	9.3	86.3
Beverage and tobacco products	312	7,723	2.3	5.2	92.5
Textile, apparel, and leather products	313–16	10,554	6.3	7.2	86.5
Wood products	321	11,012	2.7	4.4	92.9
Paper	322	2,117	6.6	6.8	86.6
Printing and related support activities	323	20,851	3.2	6.1	90.7
Petroleum and coal products	324	583	9.3 r	12.2 r	78.4
Chemicals	325	7,522	16.8	14.2	69.0
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	9.6	6.6 r	83.8
Pharmaceuticals and medicines	3254	1,365	27.8	14.7	57.5
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	11.9	18.0	70.1
Other chemicals	other 325	3,927	16.2	13.6	70.2
Plastics and rubber products	326	8,087	16.1	17.6	66.3
Nonmetallic mineral products	327	7,749	5.3	7.3	87.4
Primary metals	331	2,537	10.1	14.3	75.6
Fabricated metal products	332	48,472	7.8	9.8	82.4
Machinery	333	18,558	14.7	11.6	73.7
Computer and electronic products	334	9,036	23.9	17.2	58.9
Communications equipment	3342	974	25.4	18.1	56.5
Semiconductor and other electronic components	3344	2,796	19.7	16.5	63.8
Navigational, measuring, electromedical, and control instruments	3345	3,909	29.7	17.9	52.4
Other computer and electronic products	other 334	1,359	14.9	16.2	68.9
Electrical equipment, appliances, and components	335	4,000	18.0	16.7	65.3
Transportation equipment	336	7,175	13.7	13.3	73.0
Automobiles, bodies, trailers, and parts	3361–63	4,565	13.6	12.8	73.6
Aerospace products and parts	3364	985	17.7	13.6	68.7
Other transportation	other 336	1,625	11.5	14.3	74.2
Furniture and related products	337	12,647	3.3	7.6	89.1
Miscellaneous	339	20,669	10.3	9.8	79.9
Medical equipment and supplies	3391	8,060	13.6	9.8	76.6
Other miscellaneous manufacturing	3399	12,608	8.2	9.9	81.9
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	3.0	5.3	91.7
Agriculture, forestry, fishing, and hunting	11	21,606	1.1	4.7	94.2
Mining, extraction, and support activities	21	14,969	2.3	4.1	93.6
Utilities	22	2,684	3.6	4.9	91.5
Construction	23	613,110	2.0	4.4	93.6
Wholesale trade	42	257,153	6.2	8.8	85.0
Retail trade	44–45	560,952	3.5	6.5	90.0
Transportation and warehousing	48–49	152,463	2.6	4.5	92.9
Information	51	61,638	5.6	8.8	85.6
Publishing	511	17,590	7.8	11.7	80.5
Newspaper, periodical, book, and directory publishers	5111	9,761	2.2	5.5	92.3
Software publishers	5112	7,828	14.8	19.3	65.9
Telecommunications	517	7,164	5.9	10.7	83.4
Data processing, hosting, and related services	518	8,918	10.3	12.9	76.8
Other information	other 51	27,965	2.7	5.2	92.1

TABLE 72

**Importance of utility patents, by industry: 2018**

(Number and percent)

Industry	NAICS code	Companies (number)	Very important	Somewhat important	Not at all important
Finance and insurance	52	200,857	2.2	3.1	94.7
Real estate and rental and leasing	53	255,783	1.1	2.7	96.2
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	10.5	13.2	76.3
Other real estate and rental and leasing	other 53	253,970	1.1	2.6	96.3
Professional, scientific, and technical services	54	695,672	4.0	4.9	91.1
Legal services	5411	152,243	1.5	1.7	96.8
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	1.3	2.5	96.2
Architectural, engineering, and related services	5413	88,491	4.9	6.3	88.8
Specialized design services	5414	26,282	3.8	3.9	92.3
Computer systems design and related services	5415	95,950	7.8	10.6	81.6
Management, scientific, and technical consulting services	5416	132,989	3.8	5.6	90.6
Scientific research and development services	5417	9,798	41.8	13.2	45.0
Advertising, public relations, and related services	5418	27,677	2.7	6.0	91.3
Other professional, scientific, and technical services	5419	55,569	2.5	3.5	94.0
Management of companies and enterprises	55	2,409	7.2	1.7 r	91.1
Administrative and support and waste management and remediation services	56	287,807	2.2	4.2	93.6
Educational services	61	53,912	3.3	3.9	92.8
Health care and social assistance	62	519,556	2.7	4.7	92.6
Health care services	621-23	459,855	2.7	4.8	92.5
Social assistance	624	59,700	3.0	4.0	93.0
Arts, entertainment, and recreation	71	88,831	2.1	3.6	94.3
Accommodation and food services	72	453,059	3.5	7.9	88.6
Other services	81	345,125	2.4	5.2	92.4

r = relative standard error &gt; 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.

TABLE 73

**Importance of utility patents, by company size: 2018**

(Number and percent)

Employment size	Companies (number)	Very important	Somewhat important	Not at all important
All companies	4,805,151	3.3	5.5	91.2
Micro companies				
1–4	2,667,724	2.8	4.9	92.3
5–9	936,576	3.5	5.8	90.7
Small companies				
10–19	579,513	3.9	6.4	89.7
20–49	402,199	3.9	6.5	89.6
Medium companies				
50–99	119,497	5.4	7.3	87.3
100–249	65,565	6.5	8.0	85.5
Large companies				
250–499	18,897	6.9	9.9	83.2
500–999	7,289	8.5	13.4	78.1
1,000–4,999	6,199	11.3	13.9 r	74.8
5,000–9,999	823	21.3	15.1	63.5
10,000–24,999	514	28.3	14.0	57.7
25,000 or more	358	27.0	26.4 r	46.7

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 74

**Importance of design patents, by industry: 2018**

(Number and percent)

Industry	NAICS code	Companies (number)	Very important	Somewhat important	Not at all important
All industries	11, 21–23, 31–33, 42–81	4,805,151	3.6	6.3	90.0
Manufacturing industries	31–33	217,565	9.4	11.4	79.1
Food	311	18,250	5.9	9.8	84.4
Beverage and tobacco products	312	7,723	6.3	8.3	85.4
Textile, apparel, and leather products	313–16	10,554	8.9	9.2	81.9
Wood products	321	11,012	3.7	5.8	90.5
Paper	322	2,117	7.5	6.3	86.2
Printing and related support activities	323	20,851	4.6	8.0	87.4
Petroleum and coal products	324	583	12.9	11.1	75.8
Chemicals	325	7,522	12.7	14.6	72.8
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	8.1	8.3	83.6
Pharmaceuticals and medicines	3254	1,365	18.2	15.5	66.4
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	8.4	18.8	72.7
Other chemicals	other 325	3,927	13.3	13.4	73.3
Plastics and rubber products	326	8,087	18.2	19.5	62.3
Nonmetallic mineral products	327	7,749	5.9	8.8	85.2
Primary metals	331	2,537	11.4	15.5	73.1
Fabricated metal products	332	48,472	8.3	10.5	81.2
Machinery	333	18,558	15.5	15.7	68.8
Computer and electronic products	334	9,036	18.9	19.9	61.1
Communications equipment	3342	974	19.6	20.2	60.2
Semiconductor and other electronic components	3344	2,796	16.5	20.9	62.6
Navigational, measuring, electromedical, and control instruments	3345	3,909	22.6	21.1	56.4
Other computer and electronic products	other 334	1,359	13.0	14.5	72.6
Electrical equipment, appliances, and components	335	4,000	18.0	17.7	64.4
Transportation equipment	336	7,175	14.4	15.1	70.5
Automobiles, bodies, trailers, and parts	3361–63	4,565	13.5	15.7	70.9
Aerospace products and parts	3364	985	19.8	14.3	65.9
Other transportation	other 336	1,625	14.0	13.9	72.1
Furniture and related products	337	12,647	5.3	8.5	86.2
Miscellaneous	339	20,669	10.7	12.3	77.0
Medical equipment and supplies	3391	8,060	13.4	11.6	75.0
Other miscellaneous manufacturing	3399	12,608	9.0	12.7	78.2
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	3.4	6.1	90.6
Agriculture, forestry, fishing, and hunting	11	21,606	1.4	3.5	95.1
Mining, extraction, and support activities	21	14,969	1.8	3.9	94.3
Utilities	22	2,684	3.1	4.2	92.7
Construction	23	613,110	2.3	4.8	92.9
Wholesale trade	42	257,153	7.3	10.4	82.3
Retail trade	44–45	560,952	4.3	7.8	88.0
Transportation and warehousing	48–49	152,463	2.5	5.2	92.3
Information	51	61,638	5.5	9.7	84.8
Publishing	511	17,590	8.5	12.3	79.2
Newspaper, periodical, book, and directory publishers	5111	9,761	4.4	7.7	87.9
Software publishers	5112	7,828	13.5	18.1	68.4
Telecommunications	517	7,164	4.8	10.3	84.8
Data processing, hosting, and related services	518	8,918	7.8	14.5	77.6
Other information	other 51	27,965	3.2	6.3	90.6

TABLE 74

**Importance of design patents, by industry: 2018**

(Number and percent)

Industry	NAICS code	Companies (number)	Very important	Somewhat important	Not at all important
Finance and insurance	52	200,857	2.3	3.6	94.1
Real estate and rental and leasing	53	255,783	1.4	2.8	95.8
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	6.3 r	13.7	80.0
Other real estate and rental and leasing	other 53	253,970	1.4	2.7	95.9
Professional, scientific, and technical services	54	695,672	4.1	6.1	89.9
Legal services	5411	152,243	1.6	1.8	96.7
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	1.5	2.7	95.8
Architectural, engineering, and related services	5413	88,491	6.4	8.9	84.7
Specialized design services	5414	26,282	7.8	9.6	82.6
Computer systems design and related services	5415	95,950	7.2	11.7	81.1
Management, scientific, and technical consulting services	5416	132,989	3.8	6.5	89.7
Scientific research and development services	5417	9,798	17.8	17.2	64.9
Advertising, public relations, and related services	5418	27,677	4.8	8.0	87.2
Other professional, scientific, and technical services	5419	55,569	2.7	4.4	92.9
Management of companies and enterprises	55	2,409	6.3	1.6 r	92.2
Administrative and support and waste management and remediation services	56	287,807	2.5	5.0	92.5
Educational services	61	53,912	3.8	5.2	91.0
Health care and social assistance	62	519,556	2.8	4.7	92.5
Health care services	621-23	459,855	2.7	4.7	92.6
Social assistance	624	59,700	3.5	4.4	92.0
Arts, entertainment, and recreation	71	88,831	2.7	5.4	91.9
Accommodation and food services	72	453,059	4.0	8.9	87.2
Other services	81	345,125	2.7	5.8	91.5

r = relative standard error &gt; 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.

TABLE 75

**Importance of design patents, by company size: 2018**

(Number and percent)

Employment size	Companies (number)	Very important	Somewhat important	Not at all important
All companies	4,805,151	3.6	6.3	90.0
Micro companies				
1–4	2,667,724	3.0	5.5	91.5
5–9	936,576	3.7	6.7	89.6
Small companies				
10–19	579,513	4.5	7.2	88.3
20–49	402,199	4.4	8.0	87.6
Medium companies				
50–99	119,497	6.3	8.3	85.5
100–249	65,565	7.5	9.5	83.0
Large companies				
250–499	18,897	7.3	11.4	81.3
500–999	7,289	9.2	14.4	76.4
1,000–4,999	6,199	11.7 r	13.9	74.4
5,000–9,999	823	18.3	20.0	61.5
10,000–24,999	514	21.2	22.0	57.0
25,000 or more	358	21.5	32.4 r	46.1

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding or unavailable 2017 North American Industry Classification System 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.



TABLE 76

**Importance of trademarks, by industry: 2018**

(Number and percent)

Industry	NAICS code	Companies (number)	Very important	Somewhat important	Not at all important
All industries	11, 21–23, 31–33, 42–81	4,805,151	7.9	10.3	81.8
Manufacturing industries	31–33	217,565	15.6	15.5	68.9
Food	311	18,250	21.0	17.2	61.8
Beverage and tobacco products	312	7,723	38.0	26.2	35.8
Textile, apparel, and leather products	313–16	10,554	14.8	14.0	71.2
Wood products	321	11,012	6.2	10.9	82.9
Paper	322	2,117	18.0	10.7	71.3
Printing and related support activities	323	20,851	10.2	13.9	75.9
Petroleum and coal products	324	583	25.6	11.5	62.9
Chemicals	325	7,522	34.3	19.5	46.2
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	26.0	12.3	61.7
Pharmaceuticals and medicines	3254	1,365	38.9	21.9	39.2
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	46.8	21.1	32.0
Other chemicals	other 325	3,927	28.8	19.1	52.1
Plastics and rubber products	326	8,087	21.8	19.8	58.4
Nonmetallic mineral products	327	7,749	10.5	13.5	76.0
Primary metals	331	2,537	14.9	13.5	71.6
Fabricated metal products	332	48,472	9.4	12.6	78.0
Machinery	333	18,558	17.6	17.6	64.8
Computer and electronic products	334	9,036	24.9	25.7	49.3
Communications equipment	3342	974	26.7	25.6	47.6
Semiconductor and other electronic components	3344	2,796	22.4	22.2	55.4
Navigational, measuring, electromedical, and control instruments	3345	3,909	25.8	30.4	43.8
Other computer and electronic products	other 334	1,359	26.4	19.6	54.0
Electrical equipment, appliances, and components	335	4,000	23.1	20.2	56.7
Transportation equipment	336	7,175	17.8	17.4	64.8
Automobiles, bodies, trailers, and parts	3361–63	4,565	17.2	18.5	64.3
Aerospace products and parts	3364	985	17.7	16.3	66.0
Other transportation	other 336	1,625	19.8	15.1	65.1
Furniture and related products	337	12,647	6.3	10.5	83.2
Miscellaneous	339	20,669	17.7	15.5	66.8
Medical equipment and supplies	3391	8,060	14.2	12.7	73.1
Other miscellaneous manufacturing	3399	12,608	20.0	17.2	62.8
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	7.5	10.1	82.4
Agriculture, forestry, fishing, and hunting	11	21,606	2.9	4.7	92.4
Mining, extraction, and support activities	21	14,969	2.9	6.4	90.7
Utilities	22	2,684	5.9	9.3	84.8
Construction	23	613,110	4.1	6.6	89.3
Wholesale trade	42	257,153	14.1	14.9	71.0
Retail trade	44–45	560,952	9.1	12.4	78.5
Transportation and warehousing	48–49	152,463	5.3	7.3	87.4
Information	51	61,638	18.4	19.7	61.9
Publishing	511	17,590	28.6	25.7	45.7
Newspaper, periodical, book, and directory publishers	5111	9,761	22.2	19.6	58.2
Software publishers	5112	7,828	36.5	33.3	30.2
Telecommunications	517	7,164	12.9	15.9	71.2
Data processing, hosting, and related services	518	8,918	21.0	24.4	54.6
Other information	other 51	27,965	12.7	15.4	71.9

TABLE 76

**Importance of trademarks, by industry: 2018**

(Number and percent)

Industry	NAICS code	Companies (number)	Very important	Somewhat important	Not at all important
Finance and insurance	52	200,857	8.9	9.0	82.1
Real estate and rental and leasing	53	255,783	4.5	6.9	88.6
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	30.6	22.0	47.4
Other real estate and rental and leasing	other 53	253,970	4.3	6.8	88.9
Professional, scientific, and technical services	54	695,672	7.7	11.0	81.3
Legal services	5411	152,243	3.3	6.3	90.4
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	3.1	4.8	92.1
Architectural, engineering, and related services	5413	88,491	7.0	12.0	81.0
Specialized design services	5414	26,282	11.8	16.5	71.7
Computer systems design and related services	5415	95,950	13.9	19.2	66.9
Management, scientific, and technical consulting services	5416	132,989	9.7	12.1	78.2
Scientific research and development services	5417	9,798	22.9	25.6	51.5
Advertising, public relations, and related services	5418	27,677	12.7	16.7	70.6
Other professional, scientific, and technical services	5419	55,569	7.1	9.6	83.3
Management of companies and enterprises	55	2,409	12.0	5.2	82.8
Administrative and support and waste management and remediation services	56	287,807	6.0	8.9	85.1
Educational services	61	53,912	14.7	12.3	73.0
Health care and social assistance	62	519,556	4.9	7.4	87.7
Health care services	621-23	459,855	4.5	7.4	88.1
Social assistance	624	59,700	8.4	6.9	84.7
Arts, entertainment, and recreation	71	88,831	9.8	12.5	77.7
Accommodation and food services	72	453,059	11.1	14.3	74.6
Other services	81	345,125	5.5	8.5	86.0

r = relative standard error &gt; 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.

TABLE 77

**Importance of trademarks, by company size: 2018**

(Number and percent)

Employment size	Companies (number)	Very important	Somewhat important	Not at all important
All companies	4,805,151	7.9	10.3	81.8
Micro companies				
1–4	2,667,724	6.1	8.7	85.2
5–9	936,576	7.8	11.0	81.2
Small companies				
10–19	579,513	10.2	11.4	78.4
20–49	402,199	11.3	14.2	74.5
Medium companies				
50–99	119,497	15.3	16.3	68.4
100–249	65,565	18.1	17.1	64.8
Large companies				
250–499	18,897	19.9	20.7	59.4
500–999	7,289	23.9	21.1	55.0
1,000–4,999	6,199	26.7	21.1	52.2
5,000–9,999	823	40.7	22.6	36.7
10,000–24,999	514	47.6	22.7	29.7
25,000 or more	358	52.5	29.4 r	18.1

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding or unavailable 2017 North American Industry Classification System 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.

TABLE 78

**Importance of copyrights, by industry: 2018**

(Number and percent)

Industry	NAICS code	Companies (number)	Very important	Somewhat important	Not at all important
All industries	11, 21–23, 31–33, 42–81	4,805,151	7.1	9.3	83.6
Manufacturing industries	31–33	217,565	11.5	14.2	74.3
Food	311	18,250	12.4	14.8	72.8
Beverage and tobacco products	312	7,723	15.9	19.5	64.6
Textile, apparel, and leather products	313–16	10,554	11.3	12.3	76.4
Wood products	321	11,012	4.4	7.7	87.9
Paper	322	2,117	11.1	11.5	77.4
Printing and related support activities	323	20,851	10.9	15.3	73.8
Petroleum and coal products	324	583	13.1	8.4	78.5
Chemicals	325	7,522	20.6	16.5	62.9
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	17.8	10.0	72.1
Pharmaceuticals and medicines	3254	1,365	24.6	22.4	53.0
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	25.4	18.8	55.8
Other chemicals	other 325	3,927	17.6	14.5	67.9
Plastics and rubber products	326	8,087	16.2	18.7	65.1
Nonmetallic mineral products	327	7,749	9.2	11.4	79.4
Primary metals	331	2,537	15.5	11.7	72.8
Fabricated metal products	332	48,472	7.2	11.9	80.9
Machinery	333	18,558	14.5	14.9	70.6
Computer and electronic products	334	9,036	21.2	23.2	55.6
Communications equipment	3342	974	25.4	27.5	47.2
Semiconductor and other electronic components	3344	2,796	18.8	19.7	61.5
Navigational, measuring, electromedical, and control instruments	3345	3,909	21.5	25.5	53.0
Other computer and electronic products	other 334	1,359	21.9	20.7	57.3
Electrical equipment, appliances, and components	335	4,000	18.5	21.9	59.6
Transportation equipment	336	7,175	14.2	15.7	70.1
Automobiles, bodies, trailers, and parts	3361–63	4,565	13.9	16.4	69.7
Aerospace products and parts	3364	985	15.5	14.0	70.5
Other transportation	other 336	1,625	14.5	14.6	70.9
Furniture and related products	337	12,647	4.8	10.2	85.0
Miscellaneous	339	20,669	13.5	15.2	71.3
Medical equipment and supplies	3391	8,060	12.9	11.2	75.9
Other miscellaneous manufacturing	3399	12,608	13.9	17.7	68.4
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	6.9	9.1	84.0
Agriculture, forestry, fishing, and hunting	11	21,606	2.0	3.7	94.3
Mining, extraction, and support activities	21	14,969	2.4	5.9	91.7
Utilities	22	2,684	4.4	8.0	87.6
Construction	23	613,110	3.4	5.8	90.8
Wholesale trade	42	257,153	10.4	13.0	76.6
Retail trade	44–45	560,952	7.3	10.7	82.0
Transportation and warehousing	48–49	152,463	4.5	6.5	89.0
Information	51	61,638	26.0	20.0	54.0
Publishing	511	17,590	38.0	25.1	36.9
Newspaper, periodical, book, and directory publishers	5111	9,761	38.2	19.4	42.4
Software publishers	5112	7,828	37.8	32.1	30.1
Telecommunications	517	7,164	10.9	16.0	73.1
Data processing, hosting, and related services	518	8,918	21.0	23.0	56.0
Other information	other 51	27,965	24.0	16.9	59.1

TABLE 78

**Importance of copyrights, by industry: 2018**

(Number and percent)

Industry	NAICS code	Companies (number)	Very important	Somewhat important	Not at all important
Finance and insurance	52	200,857	7.0	7.9	85.1
Real estate and rental and leasing	53	255,783	3.7	6.0	90.3
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	20.4	15.5	64.1
Other real estate and rental and leasing	other 53	253,970	3.5	5.9	90.6
Professional, scientific, and technical services	54	695,672	9.9	11.4	78.7
Legal services	5411	152,243	3.3	6.7	90.0
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	3.1	4.0	92.9
Architectural, engineering, and related services	5413	88,491	13.6	14.6	71.8
Specialized design services	5414	26,282	14.6	16.4	69.0
Computer systems design and related services	5415	95,950	16.6	18.7	64.7
Management, scientific, and technical consulting services	5416	132,989	10.9	12.6	76.5
Scientific research and development services	5417	9,798	20.1	22.2	57.7
Advertising, public relations, and related services	5418	27,677	13.7	18.5	67.8
Other professional, scientific, and technical services	5419	55,569	14.9	10.1	75.0
Management of companies and enterprises	55	2,409	7.3	1.7 r	91.0
Administrative and support and waste management and remediation services	56	287,807	5.1	7.7	87.2
Educational services	61	53,912	17.2	13.1	69.7
Health care and social assistance	62	519,556	4.6	6.8	88.6
Health care services	621-23	459,855	4.2	6.7	89.1
Social assistance	624	59,700	7.8	7.7	84.5
Arts, entertainment, and recreation	71	88,831	14.4	12.2	73.4
Accommodation and food services	72	453,059	7.9	11.2	80.9
Other services	81	345,125	4.5	7.3	88.2

r = relative standard error &gt; 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.

TABLE 79

**Importance of copyrights, by company size: 2018**

(Number and percent)

Employment size	Companies (number)	Very important	Somewhat important	Not at all important
All companies	4,805,151	7.1	9.3	83.6
Micro companies				
1–4	2,667,724	6.4	8.2	85.4
5–9	936,576	6.8	9.4	83.8
Small companies				
10–19	579,513	8.1	10.2	81.7
20–49	402,199	8.3	12.1	79.6
Medium companies				
50–99	119,497	10.9	13.5	75.6
100–249	65,565	13.2	14.2	72.6
Large companies				
250–499	18,897	14.0	15.3	70.7
500–999	7,289	15.7	16.9	67.4
1,000–4,999	6,199	18.5	22.0	59.5
5,000–9,999	823	25.6	26.6	47.9
10,000–24,999	514	33.5	23.3	43.2
25,000 or more	358	33.0	38.6 r	28.4

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding or unavailable 2017 North American Industry Classification System 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.

TABLE 80

**Importance of trade secrets, by industry: 2018**

(Number and percent)

Industry	NAICS code	Companies (number)	Very important	Somewhat important	Not at all important
All industries	11, 21–23, 31–33, 42–81	4,805,151	8.6	10.8	80.6
Manufacturing industries	31–33	217,565	19.9	17.0	63.1
Food	311	18,250	25.6	18.3	56.1
Beverage and tobacco products	312	7,723	21.5	23.6	54.9
Textile, apparel, and leather products	313–16	10,554	14.8	14.0	71.2
Wood products	321	11,012	9.3	9.9	80.8
Paper	322	2,117	23.4	14.7	61.9
Printing and related support activities	323	20,851	8.6	13.6	77.8
Petroleum and coal products	324	583	39.0	19.2	41.8
Chemicals	325	7,522	46.7	17.2	36.1
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	32.0	9.1	58.9
Pharmaceuticals and medicines	3254	1,365	54.0	17.7	28.3
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	53.2	19.6	27.2
Other chemicals	other 325	3,927	43.6	17.4	39.1
Plastics and rubber products	326	8,087	31.2	20.6	48.2
Nonmetallic mineral products	327	7,749	15.5	14.1	70.4
Primary metals	331	2,537	25.7	22.0	52.3
Fabricated metal products	332	48,472	16.7	16.6	66.7
Machinery	333	18,558	24.7	21.2	54.1
Computer and electronic products	334	9,036	40.1	21.2	38.7
Communications equipment	3342	974	46.0	19.7	34.4
Semiconductor and other electronic components	3344	2,796	35.5	20.4	44.1
Navigational, measuring, electromedical, and control instruments	3345	3,909	45.0	22.7	32.3
Other computer and electronic products	other 334	1,359	31.2	19.5	49.3
Electrical equipment, appliances, and components	335	4,000	28.1	23.6	48.3
Transportation equipment	336	7,175	24.5	20.3	55.2
Automobiles, bodies, trailers, and parts	3361–63	4,565	22.7	22.3	55.0
Aerospace products and parts	3364	985	38.0	14.0	48.0
Other transportation	other 336	1,625	21.5	18.3	60.2
Furniture and related products	337	12,647	8.0	13.4	78.6
Miscellaneous	339	20,669	18.3	16.6	65.1
Medical equipment and supplies	3391	8,060	18.2	13.6	68.2
Other miscellaneous manufacturing	3399	12,608	18.4	18.4	63.2
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	8.1	10.5	81.4
Agriculture, forestry, fishing, and hunting	11	21,606	3.9	6.5	89.6
Mining, extraction, and support activities	21	14,969	6.9	9.1	84.0
Utilities	22	2,684	8.8	8.0	83.2
Construction	23	613,110	5.5	9.0	85.5
Wholesale trade	42	257,153	14.1	15.6	70.3
Retail trade	44–45	560,952	7.9	11.8	80.3
Transportation and warehousing	48–49	152,463	6.0	8.1	85.9
Information	51	61,638	16.6	18.2	65.2
Publishing	511	17,590	23.8	20.8	55.4
Newspaper, periodical, book, and directory publishers	5111	9,761	10.3	15.1	74.6
Software publishers	5112	7,828	40.6	28.0	31.3
Telecommunications	517	7,164	14.3	20.4	65.3
Data processing, hosting, and related services	518	8,918	24.9	21.8	53.3
Other information	other 51	27,965	9.9	14.8	75.3

TABLE 80

**Importance of trade secrets, by industry: 2018**

(Number and percent)

Industry	NAICS code	Companies (number)	Very important	Somewhat important	Not at all important
Finance and insurance	52	200,857	11.3	9.2	79.5
Real estate and rental and leasing	53	255,783	4.1	7.0	88.9
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	20.5 r	31.1	48.4
Other real estate and rental and leasing	other 53	253,970	4.0	6.8	89.2
Professional, scientific, and technical services	54	695,672	10.0	11.4	78.6
Legal services	5411	152,243	4.4	6.4	89.2
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	4.5	5.1	90.4
Architectural, engineering, and related services	5413	88,491	11.3	14.2	74.5
Specialized design services	5414	26,282	9.2	14.3	76.5
Computer systems design and related services	5415	95,950	18.9	19.1	62.0
Management, scientific, and technical consulting services	5416	132,989	11.7	13.3	75.0
Scientific research and development services	5417	9,798	46.9	16.6	36.5
Advertising, public relations, and related services	5418	27,677	11.7	16.0	72.3
Other professional, scientific, and technical services	5419	55,569	7.6	10.6	81.8
Management of companies and enterprises	55	2,409	15.2	2.0 r	82.8
Administrative and support and waste management and remediation services	56	287,807	7.8	10.3	81.9
Educational services	61	53,912	9.8	13.6	76.6
Health care and social assistance	62	519,556	5.2	7.1	87.7
Health care services	621-23	459,855	5.0	7.3	87.7
Social assistance	624	59,700	6.9	5.6	87.5
Arts, entertainment, and recreation	71	88,831	5.8	10.7	83.5
Accommodation and food services	72	453,059	10.9	13.9	75.2
Other services	81	345,125	6.6	9.0	84.4

r = relative standard error &gt; 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.



TABLE 81

**Importance of trade secrets, by company size: 2018**

(Number and percent)

Employment size	Companies (number)	Very important	Somewhat important	Not at all important
All companies	4,805,151	8.6	10.8	80.6
Micro companies				
1–4	2,667,724	6.6	9.1	84.3
5–9	936,576	8.9	11.3	79.8
Small companies				
10–19	579,513	11.0	12.5	76.5
20–49	402,199	12.7	14.9	72.4
Medium companies				
50–99	119,497	16.4	17.1	66.5
100–249	65,565	19.6	17.0	63.4
Large companies				
250–499	18,897	21.2	19.6	59.2
500–999	7,289	24.9	21.7	53.4
1,000–4,999	6,199	25.9	20.9	53.2
5,000–9,999	823	36.8	25.9	37.2
10,000–24,999	514	42.5	17.7	39.8
25,000 or more	358	39.7	30.8 r	29.5

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding or unavailable 2017 North American Industry Classification System 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.

TABLE 82

**Importance of nondisclosure agreements, by industry: 2018**

(Number and percent)

Industry	NAICS code	Companies (number)	Very important	Somewhat important	Not at all important
All industries	11, 21–23, 31–33, 42–81	4,805,151	10.2	13.0	76.8
Manufacturing industries	31–33	217,565	19.2	18.9	61.9
Food	311	18,250	20.5	19.4	60.1
Beverage and tobacco products	312	7,723	16.7	23.2	60.1
Textile, apparel, and leather products	313–16	10,554	12.5	14.9	72.6
Wood products	321	11,012	5.6	10.9	83.5
Paper	322	2,117	22.8	24.7	52.5
Printing and related support activities	323	20,851	10.7	15.1	74.2
Petroleum and coal products	324	583	22.6	19.3	58.2
Chemicals	325	7,522	42.2	21.2	36.6
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	25.3	15.3	59.4
Pharmaceuticals and medicines	3254	1,365	52.9	22.6	24.5
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	42.1	23.0	34.9
Other chemicals	other 325	3,927	41.2	20.8	38.1
Plastics and rubber products	326	8,087	31.2	23.1	45.7
Nonmetallic mineral products	327	7,749	11.2	16.4	72.4
Primary metals	331	2,537	23.4	27.4	49.2
Fabricated metal products	332	48,472	19.0	19.9	61.1
Machinery	333	18,558	26.6	22.0	51.4
Computer and electronic products	334	9,036	40.6	25.7	33.7
Communications equipment	3342	974	43.8	23.5	32.6
Semiconductor and other electronic components	3344	2,796	45.8	25.5	28.6
Navigational, measuring, electromedical, and control instruments	3345	3,909	39.8	26.0	34.2
Other computer and electronic products	other 334	1,359	29.6	26.8	43.6
Electrical equipment, appliances, and components	335	4,000	30.6	25.2	44.2
Transportation equipment	336	7,175	24.6	22.3	53.1
Automobiles, bodies, trailers, and parts	3361–63	4,565	21.7	24.7	53.6
Aerospace products and parts	3364	985	39.1	21.3	39.6
Other transportation	other 336	1,625	23.9	16.0	60.1
Furniture and related products	337	12,647	6.1	11.3	82.6
Miscellaneous	339	20,669	15.3	18.2	66.5
Medical equipment and supplies	3391	8,060	16.7	16.3	67.0
Other miscellaneous manufacturing	3399	12,608	14.5	19.5	66.0
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	9.8	12.7	77.5
Agriculture, forestry, fishing, and hunting	11	21,606	4.8	5.1	90.1
Mining, extraction, and support activities	21	14,969	9.4	11.8	78.8
Utilities	22	2,684	11.8	14.3	73.9
Construction	23	613,110	5.1	9.1	85.8
Wholesale trade	42	257,153	14.3	18.4	67.3
Retail trade	44–45	560,952	7.1	12.3	80.6
Transportation and warehousing	48–49	152,463	6.8	10.9	82.3
Information	51	61,638	23.2	24.2	52.6
Publishing	511	17,590	26.6	26.2	47.1
Newspaper, periodical, book, and directory publishers	5111	9,761	12.5	20.8	66.7
Software publishers	5112	7,828	44.3	33.1	22.7
Telecommunications	517	7,164	21.7	22.6	55.7
Data processing, hosting, and related services	518	8,918	37.6	24.5	37.8
Other information	other 51	27,965	16.7	23.3	60.0

TABLE 82

**Importance of nondisclosure agreements, by industry: 2018**

(Number and percent)

Industry	NAICS code	Companies (number)	Very important	Somewhat important	Not at all important
Finance and insurance	52	200,857	14.6	13.2	72.2
Real estate and rental and leasing	53	255,783	7.0	11.2	81.8
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	26.1	21.7	52.2
Other real estate and rental and leasing	other 53	253,970	6.9	11.1	82.0
Professional, scientific, and technical services	54	695,672	17.3	17.5	65.2
Legal services	5411	152,243	8.5	12.4	79.1
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	12.1	10.4	77.5
Architectural, engineering, and related services	5413	88,491	17.0	19.1	63.9
Specialized design services	5414	26,282	16.0	19.3	64.7
Computer systems design and related services	5415	95,950	32.1	24.3	43.7
Management, scientific, and technical consulting services	5416	132,989	20.4	22.8	56.8
Scientific research and development services	5417	9,798	55.8	18.6	25.6
Advertising, public relations, and related services	5418	27,677	20.1	21.5	58.4
Other professional, scientific, and technical services	5419	55,569	11.7	15.1	73.2
Management of companies and enterprises	55	2,409	12.1	3.8 r	84.1
Administrative and support and waste management and remediation services	56	287,807	9.7	12.9	77.4
Educational services	61	53,912	14.0	15.3	70.7
Health care and social assistance	62	519,556	9.2	10.1	80.7
Health care services	621-23	459,855	8.9	10.3	80.8
Social assistance	624	59,700	11.4	8.4	80.2
Arts, entertainment, and recreation	71	88,831	9.3	14.9	75.8
Accommodation and food services	72	453,059	7.8	12.7	79.5
Other services	81	345,125	5.5	9.2	85.3

r = relative standard error &gt; 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.

TABLE 83

**Importance of nondisclosure agreements, by company size: 2018**

(Number and percent)

Employment size	Companies (number)	Very important	Somewhat important	Not at all important
All companies	4,805,151	10.2	13.0	76.8
Micro companies				
1-4	2,667,724	8.1	11.2	80.7
5-9	936,576	10.3	13.2	76.5
Small companies				
10-19	579,513	12.5	14.6	72.9
20-49	402,199	14.6	17.5	67.9
Medium companies				
50-99	119,497	18.5	21.0	60.5
100-249	65,565	22.4	23.1	54.5
Large companies				
250-499	18,897	22.9	28.4	48.7
500-999	7,289	27.1	27.5	45.3
1,000-4,999	6,199	29.6	26.3	44.1
5,000-9,999	823	37.5	28.7	33.8
10,000-24,999	514	42.9	25.0	32.0
25,000 or more	358	43.8	32.4 r	23.8

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 84

**Use of artificial intelligence as a production technology for goods and services, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Did not use	Tested, but not used in production or service	Low use	Moderate use	High use	Don't know
All industries	11, 21–23, 31–33, 42–81	4,805,151	89.9	0.4	1.6	1.0	0.4	6.7
Manufacturing industries	31–33	217,565	89.4	0.4	1.5	1.0	0.4	7.3
Food	311	18,250	89.0	0.2 r	1.3	0.4	0.0	9.1
Beverage and tobacco products	312	7,723	93.1	0.2	0.9	0.5	D	5.2
Textile, apparel, and leather products	313–16	10,554	89.0	D	0.5	0.3	0.6 r	9.5
Wood products	321	11,012	90.9	0.6 r	1.0	0.3	0.4 r	6.8
Paper	322	2,117	94.6	0.2	0.7	D	0.0	4.3
Printing and related support activities	323	20,851	91.2	0.1	1.1	0.7	0.1 r	6.8
Petroleum and coal products	324	583	94.2	0.0	D	D	0.0	5.0
Chemicals	325	7,522	89.4	0.5	1.7	1.4	0.4 r	6.6
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	94.8	0.0	0.0	0.0	0.0	5.2
Pharmaceuticals and medicines	3254	1,365	90.0	0.6	1.4	1.4	D	6.5
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	89.5	0.9 r	1.8	1.0 r	0.0	6.8
Other chemicals	other 325	3,927	88.6	0.3 r	2.0	1.7	0.7 r	6.7
Plastics and rubber products	326	8,087	89.3	1.1 r	1.8	1.0	0.1 r	6.7
Nonmetallic mineral products	327	7,749	90.6	0.0	1.1 r	0.5	0.1	7.7
Primary metals	331	2,537	93.0	0.5 r	1.1	0.6	0.3 r	4.5
Fabricated metal products	332	48,472	90.2	0.1 r	1.6	1.0	0.5	6.6
Machinery	333	18,558	86.2	0.7	2.4	1.8	0.6 r	8.3
Computer and electronic products	334	9,036	85.8	1.6	2.5	1.5	0.9	7.7
Communications equipment	3342	974	86.6	1.4 r	1.7 r	2.8 r	0.9 r	6.6
Semiconductor and other electronic components	3344	2,796	87.6	0.8 r	2.5	0.9	0.6 r	7.6
Navigational, measuring, electromedical, and control instruments	3345	3,909	84.1	2.3	2.4	1.4	1.2 r	8.6
Other computer and electronic products	other 334	1,359	86.3	1.3 r	3.4	2.4	0.6	6.0
Electrical equipment, appliances, and components	335	4,000	87.3	1.0	2.3	2.3	0.8 r	6.3
Transportation equipment	336	7,175	85.9	0.4	2.8	1.8 r	0.3	8.8
Automobiles, bodies, trailers, and parts	3361–63	4,565	83.4	0.3	3.5	2.6 r	0.4	9.8
Aerospace products and parts	3364	985	85.6	1.3 r	2.4	0.8	D	9.6
Other transportation	other 336	1,625	92.9	D	1.0	D	0.0	5.5
Furniture and related products	337	12,647	90.8	0.2 r	1.2	1.1	0.8 r	5.9
Miscellaneous	339	20,669	88.0	0.4 r	1.2	1.4	0.6 r	8.4
Medical equipment and supplies	3391	8,060	84.9	0.2	1.6	1.5	0.5	11.3
Other miscellaneous manufacturing	3399	12,608	89.9	0.6 r	1.0	1.4	0.7 r	6.4
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	90.0	0.4	1.6	1.0	0.4	6.6
Agriculture, forestry, fishing, and hunting	11	21,606	95.2	D	0.8 r	D	D	3.4
Mining, extraction, and support activities	21	14,969	92.7	0.1	1.5 r	0.1	D	5.4
Utilities	22	2,684	90.5	0.1	0.9	1.4 r	D	7.0
Construction	23	613,110	93.0	0.1	0.9	0.6	0.2	5.2
Wholesale trade	42	257,153	90.3	0.3	1.1	0.7	0.3	7.3
Retail trade	44–45	560,952	90.5	0.3	1.3	0.8	0.3	6.8
Transportation and warehousing	48–49	152,463	88.8	0.3	0.9	1.1	0.3	8.6
Information	51	61,638	83.4	2.6	3.2	2.0	1.4	7.4

TABLE 84

**Use of artificial intelligence as a production technology for goods and services, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Did not use	Tested, but not used in production or service	Low use	Moderate use	High use	Don't know
Publishing	511	17,590	81.8	3.8	4.0	1.8	1.7	6.9
Newspaper, periodical, book, and directory publishers	5111	9,761	89.6	0.4 r	2.7	0.7	0.4 r	6.2
Software publishers	5112	7,828	72.0	8.0	5.6	3.3	3.4	7.7
Telecommunications	517	7,164	83.6	0.8	2.2	1.4	0.2 r	11.8
Data processing, hosting, and related services	518	8,918	74.8	4.6	5.5	4.2	3.5	7.4
Other information	other 51	27,965	86.9	1.8	2.2	1.6	0.8	6.7
Finance and insurance	52	200,857	87.0	0.4	2.1	1.4	0.9	8.2
Real estate and rental and leasing	53	255,783	89.9	0.5	1.9	1.1	0.3	6.3
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	97.6	0.0	0.0	0.0	0.0	D
Other real estate and rental and leasing	other 53	253,970	89.9	0.5	1.9	1.1	0.3	6.3
Professional, scientific, and technical services	54	695,672	86.8	1.3	2.9	1.7	0.9	6.4
Legal services	5411	152,243	88.1	0.4	2.5	0.9	0.5	7.6
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	87.2	0.5	2.5	1.3	0.8	7.7
Architectural, engineering, and related services	5413	88,491	90.2	0.6	1.7	1.2	0.5	5.8
Specialized design services	5414	26,282	89.7	1.0	2.6	1.6	D	4.9
Computer systems design and related services	5415	95,950	78.3	4.1	5.9	4.0	2.3	5.4
Management, scientific, and technical consulting services	5416	132,989	88.3	1.5	2.9	1.4	0.7	5.2
Scientific research and development services	5417	9,798	81.7	2.3	3.6	2.7	2.5	7.2
Advertising, public relations, and related services	5418	27,677	87.9	1.2	2.4	2.1	0.5	5.9
Other professional, scientific, and technical services	5419	55,569	88.3	0.7	2.4	1.1	0.5	7.0
Management of companies and enterprises	55	2,409	88.4	0.0	D	D	D	7.8
Administrative and support and waste management and remediation services	56	287,807	91.4	0.3	1.4	0.9	0.3	5.7
Educational services	61	53,912	92.5	0.2	1.9	0.6 r	0.4	4.4
Health care and social assistance	62	519,556	90.0	0.2	1.6	1.1	0.5	6.6
Health care services	621–23	459,855	89.9	0.2	1.7	1.2	0.5	6.5
Social assistance	624	59,700	91.1	0.2 r	1.1	0.5	D	6.9
Arts, entertainment, and recreation	71	88,831	93.0	0.2 r	1.0	0.5	D	5.1
Accommodation and food services	72	453,059	90.0	0.2	1.0	0.6	0.3	7.9
Other services	81	345,125	90.6	0.2	1.0	0.6	0.2	7.4

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

TABLE 85

**Use of artificial intelligence as a production technology for goods and services, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	Did not use	Tested, but not used in production or service	Low use	Moderate use	High use	Don't know
All companies	4,805,151	89.9	0.4	1.6	1.0	0.4	6.7
Micro companies							
1–4	2,667,724	90.4	0.4	1.5	0.9	0.3	6.5
5–9	936,576	89.7	0.4	1.6	1.0	0.5	6.8
Small companies							
10–19	579,513	90.1	0.4	1.5	1.0	0.5	6.5
20–49	402,199	89.4	0.5	1.6	1.1	0.5	6.9
Medium companies							
50–99	119,497	88.3	0.5	1.9	1.7	0.4	7.2
100–249	65,565	86.6	0.6	2.2	1.2	0.7	8.7
Large companies							
250–499	18,897	81.3	1.4	2.7	2.6	1.7	10.3
500–999	7,289	82.4	1.2	3.8	2.0	0.5	10.1
1,000–4,999	6,199	73.5	2.6	5.2 r	3.0 r	0.7	15.0
5,000–9,999	823	58.8	2.9	9.2	6.4	1.3	21.4
10,000–24,999	514	47.9	5.1	9.7	7.4	1.6	28.2
25,000 or more	358	33.6	6.4	11.6	7.4	1.4	39.6 r

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 86

**Use of cloud-based computing systems and applications as a production technology for goods and services, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Did not use	Tested, but not used in production or service	Low use	Moderate use	High use	Don't know	
All industries	11, 21–23, 31–33, 42–81	4,805,151	60.7	0.8	10.4	11.5	10.4	6.2	
Manufacturing industries	31–33	217,565	64.6	1.0	12.0	10.2	6.4	5.8	
Food	311	18,250	67.8	0.4	10.4	8.1	5.8	7.5	
Beverage and tobacco products	312	7,723	46.9	0.4	17.7	17.7	13.2	4.1	
Textile, apparel, and leather products	313–16	10,554	68.5	0.4	9.6	8.5	6.4	6.6	
Wood products	321	11,012	77.2	0.6	8.3	6.4	3.5	4.0	
Paper	322	2,117	58.2	1.4	r 14.4	17.3	5.4	3.4	
Printing and related support activities	323	20,851	52.2	0.3	17.2	16.1	8.6	5.6	
Petroleum and coal products	324	583	53.9	0.0	26.7	9.8	r 4.1	r 5.5	
Chemicals	325	7,522	58.0	1.4	9.4	14.6	9.0	7.6	
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	52.8	D	3.5	25.3	4.4	12.0	r
Pharmaceuticals and medicines	3254	1,365	52.8	2.0	r 13.3	14.8	10.2	7.0	
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	57.6	1.4	r 9.8	13.0	11.4	r 6.7	
Other chemicals	other 325	3,927	60.6	1.0	8.7	13.6	8.5	7.6	
Plastics and rubber products	326	8,087	59.8	1.2	14.7	12.8	6.2	5.3	
Nonmetallic mineral products	327	7,749	71.7	0.6	10.2	7.5	4.6	5.4	
Primary metals	331	2,537	61.1	2.2	r 14.5	13.6	4.4	4.2	
Fabricated metal products	332	48,472	72.1	1.0	10.8	7.8	3.8	4.5	
Machinery	333	18,558	62.0	1.6	12.0	10.6	7.6	6.2	
Computer and electronic products	334	9,036	54.7	3.1	14.3	12.3	8.6	7.0	
Communications equipment	3342	974	52.7	6.5	r 10.9	10.6	12.3	6.9	
Semiconductor and other electronic components	3344	2,796	53.9	1.6	15.6	14.8	6.2	7.9	
Navigational, measuring, electromedical, and control instruments	3345	3,909	57.6	3.4	13.6	11.2	7.6	6.5	
Other computer and electronic products	other 334	1,359	48.8	3.0	r 16.0	11.7	13.8	6.6	
Electrical equipment, appliances, and components	335	4,000	59.2	2.2	11.7	12.2	8.3	6.4	
Transportation equipment	336	7,175	65.8	1.1	13.1	9.0	4.6	6.4	
Automobiles, bodies, trailers, and parts	3361–63	4,565	65.6	1.1	13.7	8.9	4.8	5.9	
Aerospace products and parts	3364	985	55.2	2.0	r 16.2	12.6	5.5	8.6	r
Other transportation	other 336	1,625	72.6	0.7	r 9.2	7.1	3.6	6.8	
Furniture and related products	337	12,647	72.2	0.9	r 9.0	7.0	4.6	6.3	
Miscellaneous	339	20,669	61.5	0.6	11.8	9.6	9.4	7.1	
Medical equipment and supplies	3391	8,060	62.3	0.9	r 11.5	7.8	6.1	11.4	
Other miscellaneous manufacturing	3399	12,608	60.9	0.3	12.1	10.8	11.5	4.4	
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	60.6	0.8	10.3	11.5	10.6	6.2	
Agriculture, forestry, fishing, and hunting	11	21,606	82.6	D	6.8	6.2	1.6	2.3	
Mining, extraction, and support activities	21	14,969	75.2	0.9	r 6.8	6.3	6.3	4.5	
Utilities	22	2,684	60.5	2.2	r 13.2	13.1	5.8	5.2	
Construction	23	613,110	71.5	0.6	9.1	8.4	5.2	5.2	
Wholesale trade	42	257,153	62.8	1.2	11.2	11.3	7.6	5.9	
Retail trade	44–45	560,952	68.5	0.8	9.0	8.2	6.3	7.2	
Transportation and warehousing	48–49	152,463	69.4	0.5	8.6	8.2	6.3	7.0	
Information	51	61,638	34.5	1.7	13.8	18.4	25.7	6.0	



TABLE 86

**Use of cloud-based computing systems and applications as a production technology for goods and services, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Did not use	Tested, but not used in production or service	Low use	Moderate use	High use	Don't know
Publishing	511	17,590	31.0	3.0	13.8	18.0	29.5	4.8
Newspaper, periodical, book, and directory publishers	5111	9,761	41.7	1.4	16.2	20.0	16.3	4.4
Software publishers	5112	7,828	17.8	4.9	10.7	15.4	46.0	5.3
Telecommunications	517	7,164	38.2	1.3	14.1	19.2	15.7	11.5
Data processing, hosting, and related services	518	8,918	21.3	1.7	11.8	14.7	44.4	6.2
Other information	other 51	27,965	39.9	1.1	14.4	19.6	19.8	5.2
Finance and insurance	52	200,857	43.8	0.7	11.2	17.3	19.8	7.1
Real estate and rental and leasing	53	255,783	55.5	0.6	10.9	13.7	13.0	6.3
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	49.8	D	7.1	r 17.8	19.5	2.5
Other real estate and rental and leasing	other 53	253,970	55.5	0.6	10.9	13.7	13.0	6.3
Professional, scientific, and technical services	54	695,672	41.5	1.4	14.1	18.1	19.9	5.0
Legal services	5411	152,243	40.1	0.9	14.2	18.8	19.3	6.6
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	40.7	1.0	15.7	17.7	20.6	4.3
Architectural, engineering, and related services	5413	88,491	47.6	1.0	16.2	17.6	12.5	5.1
Specialized design services	5414	26,282	43.1	0.7	12.4	16.6	23.1	4.1
Computer systems design and related services	5415	95,950	26.2	3.8	12.3	20.7	33.0	4.1
Management, scientific, and technical consulting services	5416	132,989	46.4	0.9	13.3	17.4	17.4	4.6
Scientific research and development services	5417	9,798	49.3	2.0	11.2	15.8	15.7	6.0
Advertising, public relations, and related services	5418	27,677	38.8	1.1	13.6	21.2	20.9	4.5
Other professional, scientific, and technical services	5419	55,569	50.6	0.9	14.6	14.7	14.2	5.0
Management of companies and enterprises	55	2,409	58.7	D	11.2	16.2	6.1	7.8
Administrative and support and waste management and remediation services	56	287,807	64.0	0.8	9.5	10.8	9.4	5.5
Educational services	61	53,912	52.4	0.3	13.7	14.5	14.8	4.3
Health care and social assistance	62	519,556	53.3	0.7	11.1	13.0	14.9	7.0
Health care services	621–23	459,855	52.0	0.7	11.3	13.3	15.6	7.1
Social assistance	624	59,700	64.0	0.4	9.3	10.5	9.6	6.2
Arts, entertainment, and recreation	71	88,831	62.7	0.3	11.3	12.3	8.5	4.9
Accommodation and food services	72	453,059	70.9	0.5	7.6	8.2	5.1	7.7
Other services	81	345,125	72.2	0.5	7.9	7.6	4.8	7.0

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

TABLE 87

**Use of cloud-based computing systems and applications as a production technology for goods and services, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	Did not use	Tested, but not used in production or service	Low use	Moderate use	High use	Don't know
All companies	4,805,151	60.7	0.8	10.4	11.5	10.4	6.2
Micro companies							
1–4	2,667,724	65.2	0.7	9.6	9.8	8.8	5.9
5–9	936,576	59.6	0.8	10.5	11.5	11.1	6.5
Small companies							
10–19	579,513	56.1	0.8	11.1	13.3	12.1	6.6
20–49	402,199	51.8	0.9	11.9	15.7	13.4	6.3
Medium companies							
50–99	119,497	45.1	1.1	13.5	17.8	16.0	6.6
100–249	65,565	37.6	1.3	15.0	20.6	17.8	7.8
Large companies							
250–499	18,897	34.4	1.2	13.5	23.2	18.5	9.2
500–999	7,289	33.3	0.9	13.0	25.8	15.9	11.0
1,000–4,999	6,199	25.9	1.2	13.2	26.7	19.2	13.9
5,000–9,999	823	19.0	1.6	10.8	22.8	23.1	22.6
10,000–24,999	514	13.0	1.8	12.5	28.4	19.5	24.9
25,000 or more	358	10.8	1.4	10.0	24.1	17.4	36.3

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 88

**Use of specialized software as a production technology for goods and services, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Did not use	Tested, but not used in production or service	Low use	Moderate use	High use	Don't know
All industries	11, 21–23, 31–33, 42–81	4,805,151	54.7	0.5	7.8	13.3	16.8	6.9
Manufacturing industries	31–33	217,565	51.2	0.8	9.1	15.4	16.1	7.4
Food	311	18,250	64.6	0.5	8.3	10.0	7.7	8.9
Beverage and tobacco products	312	7,723	49.9	1.1	14.0	14.2	15.4	5.5
Textile, apparel, and leather products	313–16	10,554	59.9	D	7.9	11.0	12.2	9.0
Wood products	321	11,012	64.0	0.3	6.2	11.2	11.8	6.5
Paper	322	2,117	44.9	1.6 r	15.1	18.8	14.9	4.9
Printing and related support activities	323	20,851	40.2	0.9	10.4	19.5	22.0	7.0
Petroleum and coal products	324	583	60.9	0.0	5.7 r	6.9 r	21.8	4.5
Chemicals	325	7,522	52.6	1.0	8.8	15.3	15.0	7.3
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	60.5	0.0	7.8	20.4	3.7	7.6
Pharmaceuticals and medicines	3254	1,365	49.3	2.3 r	9.9	16.7	15.5	6.5
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	58.1	0.9 r	8.5	9.8	15.2	7.3
Other chemicals	other 325	3,927	50.2	0.7	8.8	16.2	16.5	7.6
Plastics and rubber products	326	8,087	46.4	0.8 r	10.6	19.4	16.3	6.6
Nonmetallic mineral products	327	7,749	63.2	0.4	7.3	11.4	9.8	7.9
Primary metals	331	2,537	51.1	2.8 r	10.8	15.3	14.9	5.1
Fabricated metal products	332	48,472	51.7	0.5	9.5	15.7	16.2	6.5
Machinery	333	18,558	42.1	1.8	9.2	17.0	21.8	8.2
Computer and electronic products	334	9,036	39.4	1.5	10.2	19.6	21.5	7.8
Communications equipment	3342	974	33.7	2.8 r	8.8	23.2	26.7	4.9
Semiconductor and other electronic components	3344	2,796	38.9	1.1 r	12.0	20.7	18.3	9.0
Navigational, measuring, electromedical, and control instruments	3345	3,909	40.9	1.5 r	8.3	18.3	22.7	8.4
Other computer and electronic products	other 334	1,359	40.7	1.8 r	12.6	18.3	20.7	5.8
Electrical equipment, appliances, and components	335	4,000	46.2	1.2	12.0	19.7	15.2	5.9
Transportation equipment	336	7,175	52.5	1.2	8.1	14.3	16.1	7.8
Automobiles, bodies, trailers, and parts	3361–63	4,565	52.4	1.1	7.3	14.4	16.9	7.8
Aerospace products and parts	3364	985	41.8	1.2 r	7.6	16.2	24.6	8.3
Other transportation	other 336	1,625	59.1	1.6 r	10.3	12.9	8.4	7.6
Furniture and related products	337	12,647	52.2	0.2	8.6	16.4	16.2	6.4
Miscellaneous	339	20,669	49.1	0.6 r	7.3	16.1	17.6	9.3
Medical equipment and supplies	3391	8,060	48.6	0.7 r	5.9	16.1	17.6	11.1
Other miscellaneous manufacturing	3399	12,608	49.4	0.5	8.2	16.2	17.5	8.2
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	54.9	0.5	7.7	13.2	16.8	6.9
Agriculture, forestry, fishing, and hunting	11	21,606	77.1	0.0	5.0	8.3	6.2	3.4
Mining, extraction, and support activities	21	14,969	67.2	0.5 r	5.3	11.5	9.9	5.6
Utilities	22	2,684	54.3	0.6 r	13.4	14.2	11.8	5.6
Construction	23	613,110	69.0	0.6	8.0	9.9	7.2	5.3
Wholesale trade	42	257,153	60.6	0.6	8.4	12.3	10.5	7.5
Retail trade	44–45	560,952	61.7	0.5	7.2	11.0	12.1	7.5
Transportation and warehousing	48–49	152,463	63.4	0.6	6.8	10.6	10.0	8.6
Information	51	61,638	32.7	0.8	8.9	20.3	29.8	7.6

TABLE 88

**Use of specialized software as a production technology for goods and services, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Did not use	Tested, but not used in production or service	Low use	Moderate use	High use	Don't know
Publishing	511	17,590	31.0	1.1	9.9	20.9	30.6	6.6
Newspaper, periodical, book, and directory publishers	5111	9,761	39.0	0.9	11.1	23.3	19.0	6.5
Software publishers	5112	7,828	20.9	1.4	8.4	17.7	44.9	6.7
Telecommunications	517	7,164	41.0	1.0	9.0	20.2	15.7	13.1
Data processing, hosting, and related services	518	8,918	21.8	1.1	7.8	21.4	39.9	7.9
Other information	other 51	27,965	35.0	0.5	8.5	19.5	29.7	6.8
Finance and insurance	52	200,857	37.5	0.2	8.0	17.5	28.6	8.2
Real estate and rental and leasing	53	255,783	53.6	0.2	8.1	15.3	16.1	6.7
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	62.9	0.0	7.9	13.5	15.5	D
Other real estate and rental and leasing	other 53	253,970	53.5	0.2	8.1	15.3	16.1	6.7
Professional, scientific, and technical services	54	695,672	35.8	0.7	9.1	18.3	29.8	6.4
Legal services	5411	152,243	36.3	0.4	11.8	22.3	21.3	8.0
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	23.0	0.2	3.3	12.9	54.7	5.9
Architectural, engineering, and related services	5413	88,491	28.3	0.4	8.1	19.0	37.8	6.4
Specialized design services	5414	26,282	38.8	0.5	7.7	16.4	31.9	4.6
Computer systems design and related services	5415	95,950	28.2	1.6	10.2	21.9	32.5	5.6
Management, scientific, and technical consulting services	5416	132,989	51.9	1.0	11.1	15.5	14.9	5.7
Scientific research and development services	5417	9,798	41.5	1.4	8.7	20.0	20.7	7.7
Advertising, public relations, and related services	5418	27,677	44.8	0.4	10.7	18.6	20.0	5.4
Other professional, scientific, and technical services	5419	55,569	38.4	0.7	7.2	17.3	29.2	7.2
Management of companies and enterprises	55	2,409	60.5	0.0	5.6	11.5	14.6	7.8
Administrative and support and waste management and remediation services	56	287,807	61.0	0.7	7.6	10.8	13.9	6.0
Educational services	61	53,912	51.0	0.6	10.3	16.5	17.0	4.6
Health care and social assistance	62	519,556	42.5	0.4	7.0	15.6	27.4	7.1
Health care services	621–23	459,855	40.2	0.3	6.8	16.2	29.2	7.2
Social assistance	624	59,700	60.4	0.7	8.4	11.3	13.6	5.7
Arts, entertainment, and recreation	71	88,831	57.2	0.2	9.2	13.2	14.5	5.6
Accommodation and food services	72	453,059	66.2	0.3	6.4	10.0	8.8	8.3
Other services	81	345,125	61.3	0.5	7.2	11.1	12.9	7.1

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

TABLE 89

**Use of specialized software as a production technology for goods and services, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	Did not use	Tested, but not used in production or service	Low use	Moderate use	High use	Don't know
All companies	4,805,151	54.7	0.5	7.8	13.3	16.8	6.9
Micro companies							
1–4	2,667,724	60.3	0.5	7.7	11.6	13.3	6.6
5–9	936,576	51.9	0.5	7.8	14.0	18.8	7.0
Small companies							
10–19	579,513	48.3	0.5	7.8	15.3	21.1	7.0
20–49	402,199	44.4	0.6	8.1	16.5	23.2	7.2
Medium companies							
50–99	119,497	38.5	0.6	8.5	19.0	25.6	7.8
100–249	65,565	32.6	0.6	9.3	20.2	28.7	8.6
Large companies							
250–499	18,897	31.3	0.6 r	8.4	23.4	26.7	9.6
500–999	7,289	30.4	0.5	8.1 r	22.6	25.9	12.5
1,000–4,999	6,199	24.0	0.5	8.4 r	22.8	28.9	15.4
5,000–9,999	823	17.1	0.9	6.6	24.9	26.5	23.8
10,000–24,999	514	12.6	1.6	8.8	24.5	24.9	27.4
25,000 or more	358	10.6	D	3.9	20.4	24.3	41.9 r

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

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 90

**Use of robotics as a production technology for goods and services, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Did not use	Tested, but not used in production or service	Low use	Moderate use	High use	Don't know
All industries	11, 21–23, 31–33, 42–81	4,805,151	93.7	0.2	0.9	0.6	0.3	4.3
Manufacturing industries	31–33	217,565	85.6	0.6	3.6	3.4	2.5	4.3
Food	311	18,250	88.1	0.4	3.0	1.6	1.2	5.7
Beverage and tobacco products	312	7,723	90.9	0.1	2.0	1.9	1.5	3.6
Textile, apparel, and leather products	313–16	10,554	91.1	D	1.5	1.0	1.1	5.3
Wood products	321	11,012	90.7	0.1	2.5	2.7	0.7	3.3
Paper	322	2,117	82.2	D	9.4	4.4	0.8	2.9
Printing and related support activities	323	20,851	93.5	0.1	2.1	0.8	0.4	3.1
Petroleum and coal products	324	583	92.6	0.0	0.9	2.7	D	3.1
Chemicals	325	7,522	85.7	0.5	3.2	3.2	2.0	5.4
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	87.9	D	0.8	2.5	3.0	5.4
Pharmaceuticals and medicines	3254	1,365	83.7	0.7	5.7	3.2	1.6	5.1
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	86.0	0.0	5.3	4.0	0.2	4.5
Other chemicals	other 325	3,927	86.3	0.7	1.8	2.8	2.7	5.7
Plastics and rubber products	326	8,087	71.9	1.6	6.8	8.5	7.2	4.0
Nonmetallic mineral products	327	7,749	89.2	D	1.9	3.2	1.1	4.7
Primary metals	331	2,537	72.5	3.4	8.9	6.4	5.6	3.1
Fabricated metal products	332	48,472	84.6	0.9	3.7	3.8	3.0	4.0
Machinery	333	18,558	77.6	0.8	6.7	5.0	5.5	4.4
Computer and electronic products	334	9,036	78.7	1.4	5.0	6.3	3.3	5.3
Communications equipment	3342	974	85.8	1.7	1.2	5.1	1.1	5.0
Semiconductor and other electronic components	3344	2,796	75.8	0.9	6.8	6.5	4.5	5.5
Navigational, measuring, electromedical, and control instruments	3345	3,909	78.7	1.8	4.8	6.7	3.5	4.5
Other computer and electronic products	other 334	1,359	80.5	1.0	4.2	5.3	2.0	7.0
Electrical equipment, appliances, and components	335	4,000	83.4	1.3	4.4	3.6	2.8	4.5
Transportation equipment	336	7,175	79.5	0.7	5.2	7.6	3.3	3.7
Automobiles, bodies, trailers, and parts	3361–63	4,565	75.9	0.6	6.4	10.1	4.0	3.0
Aerospace products and parts	3364	985	75.8	1.8	5.5	5.5	4.8	6.5
Other transportation	other 336	1,625	92.2	D	1.4	2.0	0.5	3.8
Furniture and related products	337	12,647	89.3	0.1	1.8	3.7	1.4	3.7
Miscellaneous	339	20,669	86.8	0.4	2.8	1.9	2.5	5.6
Medical equipment and supplies	3391	8,060	80.8	0.1	2.6	2.8	5.2	8.5
Other miscellaneous manufacturing	3399	12,608	90.7	0.6	3.0	1.3	0.7	3.7
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	94.0	0.2	0.8	0.5	0.2	4.3
Agriculture, forestry, fishing, and hunting	11	21,606	96.9	D	0.7	D	D	1.7
Mining, extraction, and support activities	21	14,969	95.3	0.0	1.0	0.5	D	3.1
Utilities	22	2,684	94.6	0.6	1.0	0.2	D	3.5
Construction	23	613,110	95.3	0.1	0.7	0.4	0.2	3.3
Wholesale trade	42	257,153	93.1	0.3	1.0	0.9	0.4	4.3
Retail trade	44–45	560,952	93.1	0.2	0.8	0.7	0.4	4.8
Transportation and warehousing	48–49	152,463	93.9	0.2	0.5	0.1	0.1	5.2
Information	51	61,638	92.7	0.3	1.5	0.7	0.2	4.6

TABLE 90

**Use of robotics as a production technology for goods and services, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Did not use	Tested, but not used in production or service	Low use	Moderate use	High use	Don't know
Publishing	511	17,590	93.9	0.2	0.8	1.0	0.5	3.6
Newspaper, periodical, book, and directory publishers	5111	9,761	96.1	D	0.6	0.3	0.1	2.8
Software publishers	5112	7,828	91.0	0.5	1.1	1.8	1.1	4.5
Telecommunications	517	7,164	89.3	D	0.9	0.6	0.0	9.1
Data processing, hosting, and related services	518	8,918	91.5	0.9	2.7	0.7	0.1	4.1
Other information	other 51	27,965	93.2	0.2	r 1.7	0.6	0.1	r 4.2
Finance and insurance	52	200,857	94.4	0.1	r 0.5	0.2	0.1	r 4.7
Real estate and rental and leasing	53	255,783	95.3	0.1	r 0.3	0.1	D	4.1
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	99.2	0.0	0.0	0.0	0.0	D
Other real estate and rental and leasing	other 53	253,970	95.3	0.1	r 0.4	0.1	D	4.1
Professional, scientific, and technical services	54	695,672	94.0	0.3	1.0	0.8	0.4	3.5
Legal services	5411	152,243	96.4	0.0	0.2	0.0	D	3.3
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	96.1	0.1	0.3	0.1	r D	3.4
Architectural, engineering, and related services	5413	88,491	88.0	0.4	2.8	3.2	2.0	3.6
Specialized design services	5414	26,282	96.3	0.0	1.0	0.2	r 0.3	r 2.2
Computer systems design and related services	5415	95,950	91.6	1.0	1.8	1.0	0.4	4.2
Management, scientific, and technical consulting services	5416	132,989	95.0	0.3	1.0	0.4	0.1	3.2
Scientific research and development services	5417	9,798	83.2	1.4	4.3	3.4	2.3	5.4
Advertising, public relations, and related services	5418	27,677	95.4	0.1	0.5	0.6	0.1	3.3
Other professional, scientific, and technical services	5419	55,569	95.4	0.0	0.6	0.4	r 0.1	r 3.5
Management of companies and enterprises	55	2,409	88.3	D	1.9	r 0.0	D	7.7
Administrative and support and waste management and remediation services	56	287,807	95.4	0.1	0.6	0.2	0.1	3.6
Educational services	61	53,912	95.8	D	0.5	0.5	D	3.0
Health care and social assistance	62	519,556	93.5	0.1	1.0	0.8	0.3	4.3
Health care services	621–23	459,855	93.1	0.1	1.1	1.0	0.3	4.4
Social assistance	624	59,700	95.2	D	0.5	0.0	0.0	4.3
Arts, entertainment, and recreation	71	88,831	95.6	0.1	r 0.4	0.3	0.1	r 3.5
Accommodation and food services	72	453,059	93.4	0.1	0.5	0.2	0.1	5.7
Other services	81	345,125	93.6	0.2	0.6	0.3	0.3	5.0

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.

TABLE 91

**Use of robotics as a production technology for goods and services, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	Did not use	Tested, but not used in production or service	Low use	Moderate use	High use	Don't know
All companies	4,805,151	93.7	0.2	0.9	0.6	0.3	4.3
Micro companies							
1–4	2,667,724	94.6	0.1	0.6	0.4	0.2	4.1
5–9	936,576	93.8	0.1	0.8	0.6	0.4	4.3
Small companies							
10–19	579,513	93.1	0.2	1.1	0.9	0.5	4.2
20–49	402,199	92.4	0.3	1.2	1.0	0.6	4.5
Medium companies							
50–99	119,497	89.9	0.4	2.5	1.6	0.9	4.7
100–249	65,565	86.8	0.4	3.2	2.7	1.3	5.6
Large companies							
250–499	18,897	83.0	0.5 r	4.0	4.6	1.8	6.1
500–999	7,289	82.3	0.5	3.7	3.2	1.8	8.5
1,000–4,999	6,199	71.8	1.2	6.5 r	5.8 r	1.9	12.8
5,000–9,999	823	58.9	1.0	9.8	6.2	2.7	21.3
10,000–24,999	514	48.7	3.5	9.5	8.2	4.5	25.6
25,000 or more	358	31.7	3.9	13.0	8.1	5.0	38.3 r

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.



TABLE 92

**Use of specialized equipment as a production technology for goods and services, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Did not use	Tested, but not used in production or service	Low use	Moderate use	High use	Don't know
All industries	11, 21–23, 31–33, 42–81	4,805,151	75.9	0.3	5.3	6.9	5.6	6.0
Manufacturing industries	31–33	217,565	54.2	0.6	7.3	15.0	16.5	6.4
Food	311	18,250	62.9	0.5	5.5	11.6	11.6	7.9
Beverage and tobacco products	312	7,723	50.8	0.4	9.7	15.6	19.1	4.4
Textile, apparel, and leather products	313–16	10,554	63.1	0.3 r	5.5	10.8	13.0	7.3
Wood products	321	11,012	64.6	0.2 r	6.1	10.9	13.1	5.1
Paper	322	2,117	56.4	D	4.3	15.8	15.0	8.4
Printing and related support activities	323	20,851	55.5	0.2	7.7	14.1	16.9	5.6
Petroleum and coal products	324	583	52.1	0.0	8.2	14.9	20.1	4.6
Chemicals	325	7,522	52.5	0.6	8.0	15.4	15.8	7.7
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	56.1	0.0	6.1 r	23.0	6.7 r	8.1
Pharmaceuticals and medicines	3254	1,365	45.3	1.2 r	5.9	19.7	20.9	7.1
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	56.4	0.5	10.9	13.0	11.9	7.3
Other chemicals	other 325	3,927	52.7	0.6	7.7	13.8	17.1	8.1
Plastics and rubber products	326	8,087	44.8	1.5 r	7.7	21.7	18.2	6.0
Nonmetallic mineral products	327	7,749	63.3	0.7 r	7.2	11.3	11.3	6.2
Primary metals	331	2,537	47.5	1.0 r	4.6	20.6	18.6	7.7
Fabricated metal products	332	48,472	52.2	0.5	6.1	15.8	19.6	5.8
Machinery	333	18,558	47.3	0.8	11.1	16.3	18.4	6.0
Computer and electronic products	334	9,036	43.9	1.4	11.3	17.6	19.2	6.5
Communications equipment	3342	974	44.5	D	9.9	24.0	16.0	4.3
Semiconductor and other electronic components	3344	2,796	38.7	0.9	11.0	18.7	21.9	8.8
Navigational, measuring, electromedical, and control instruments	3345	3,909	43.4	1.6 r	12.0	17.5	19.9	5.6
Other computer and electronic products	other 334	1,359	55.6	1.9 r	11.0	11.0	14.2	6.2
Electrical equipment, appliances, and components	335	4,000	48.2	0.8	14.6	16.6	14.2	5.6
Transportation equipment	336	7,175	52.0	1.0	8.2	15.8	14.7	8.3
Automobiles, bodies, trailers, and parts	3361–63	4,565	49.9	1.0 r	8.7	17.7	14.0	8.8
Aerospace products and parts	3364	985	43.1	1.3 r	8.6	16.4	22.4	8.1
Other transportation	other 336	1,625	63.3	D	6.3	10.1	12.2	7.3
Furniture and related products	337	12,647	59.3	0.3 r	5.1	15.4	14.4	5.5
Miscellaneous	339	20,669	52.5	0.5	6.5	15.6	16.9	8.0
Medical equipment and supplies	3391	8,060	45.9	1.0 r	6.1	16.1	20.4	10.6
Other miscellaneous manufacturing	3399	12,608	56.7	0.3 r	6.8	15.3	14.6	6.3
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	76.9	0.3	5.2	6.5	5.1	6.0
Agriculture, forestry, fishing, and hunting	11	21,606	76.0	0.0	4.4	6.3	9.1	4.2
Mining, extraction, and support activities	21	14,969	77.8	0.1	5.4	5.3	6.1	5.3
Utilities	22	2,684	69.5	0.2 r	6.3	13.4	5.6	4.9
Construction	23	613,110	77.0	0.3	5.9	7.1	4.2	5.5
Wholesale trade	42	257,153	79.4	0.4	5.2	6.2	3.4	5.4
Retail trade	44–45	560,952	78.4	0.3	5.3	5.8	3.6	6.6
Transportation and warehousing	48–49	152,463	78.8	0.2	4.8	5.2	3.9	7.1
Information	51	61,638	70.2	0.6	5.6	8.1	8.8	6.7

TABLE 92

**Use of specialized equipment as a production technology for goods and services, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Did not use	Tested, but not used in production or service	Low use	Moderate use	High use	Don't know
Publishing	511	17,590	80.8	0.7	5.1	3.7	3.4	6.3
Newspaper, periodical, book, and directory publishers	5111	9,761	85.2	D	3.4	3.3	3.9	4.2
Software publishers	5112	7,828	75.4	1.5 r	7.2	4.3	2.8	8.8
Telecommunications	517	7,164	64.1	1.2	9.1	9.2	4.8	11.6
Data processing, hosting, and related services	518	8,918	74.2	0.8	5.3	8.1	5.3	6.3
Other information	other 51	27,965	63.8	0.4	5.0	10.6	14.3	5.9
Finance and insurance	52	200,857	87.8	0.1	2.8	2.4	1.0	5.9
Real estate and rental and leasing	53	255,783	88.3	0.2	3.1	2.3	1.0	5.1
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	87.3	0.0	D	D	D	5.6 r
Other real estate and rental and leasing	other 53	253,970	88.3	0.2	3.1	2.3	1.0	5.1
Professional, scientific, and technical services	54	695,672	79.2	0.5	5.2	5.7	4.4	5.0
Legal services	5411	152,243	88.9	0.1	3.1	2.1	0.6	5.2
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	86.2	0.1 r	3.6	3.3	2.0	4.8
Architectural, engineering, and related services	5413	88,491	61.0	0.5	10.0	12.4	10.3	5.8
Specialized design services	5414	26,282	79.3	0.5 r	5.2	6.4	4.6	4.0
Computer systems design and related services	5415	95,950	78.5	1.1	6.2	5.6	3.2	5.4
Management, scientific, and technical consulting services	5416	132,989	85.7	0.5	4.0	3.2	2.5	4.1
Scientific research and development services	5417	9,798	51.0	2.3	7.1	14.4	18.2	7.0
Advertising, public relations, and related services	5418	27,677	80.8	0.4 r	4.0	6.1	4.4	4.3
Other professional, scientific, and technical services	5419	55,569	59.1	0.4	7.4	13.8	13.6	5.7
Management of companies and enterprises	55	2,409	75.9	D	5.4 r	6.5 r	4.4 r	7.7
Administrative and support and waste management and remediation services	56	287,807	78.3	0.3	4.9	6.0	5.2	5.3
Educational services	61	53,912	83.7	0.2 r	4.5	3.9	3.4	4.3
Health care and social assistance	62	519,556	62.2	0.2	6.6	11.8	12.9	6.3
Health care services	621–23	459,855	58.7	0.2	7.1	13.0	14.5	6.5
Social assistance	624	59,700	89.1	0.2 r	2.8	2.5	0.6	4.8
Arts, entertainment, and recreation	71	88,831	79.1	0.2 r	4.3	5.6	5.8	5.0
Accommodation and food services	72	453,059	80.7	0.2	4.1	4.6	2.6	7.8
Other services	81	345,125	67.8	0.3	6.6	10.1	8.0	7.2

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

TABLE 93

**Use of specialized equipment as a production technology for goods and services, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	Did not use	Tested, but not used in production or service	Low use	Moderate use	High use	Don't know
All companies	4,805,151	75.9	0.3	5.3	6.9	5.6	6.0
Micro companies							
1–4	2,667,724	80.9	0.3	4.3	5.1	3.9	5.5
5–9	936,576	72.6	0.3	5.8	8.1	6.9	6.3
Small companies							
10–19	579,513	69.7	0.3	6.3	9.4	7.8	6.5
20–49	402,199	67.5	0.4	7.2	9.9	8.1	6.9
Medium companies							
50–99	119,497	64.0	0.6	8.1	10.8	8.5	8.0
100–249	65,565	59.5	0.7	8.3	13.3	9.9	8.3
Large companies							
250–499	18,897	60.7	0.5 r	6.9	13.1	7.6	11.2
500–999	7,289	56.4	0.3	8.7 r	10.4	10.7	13.5
1,000–4,999	6,199	52.0	0.5	8.6 r	11.5	11.0 r	16.4
5,000–9,999	823	42.6	1.1	8.1	15.6	7.2	25.4
10,000–24,999	514	33.7	D	8.9	13.6	10.5	32.7
25,000 or more	358	24.9	0.8	5.8	13.0	13.3	42.3 r

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

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 94

**Motivation for artificial intelligence technology adoption and utilization for companies using the technology, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To automate tasks performed by labor		To upgrade outdated processes or methods		To improve quality or reliability of processes or methods		To expand the range of goods or services		To adopt standards and accreditation		Some other reason	
All industries	11, 21–23, 31–33, 42–81	141,159		27.6		37.1		49.4		23.9		11.8		18.2
Manufacturing industries	31–33	6,327		38.3		47.5		54.8		25.5		13.1		13.7
Food	311	323		31.3		69.3		42.4		15.8	r	13.9	r	14.6
Beverage and tobacco products	312	120		43.3		47.5		69.2		25.0		0.0		D
Textile, apparel, and leather products	313–16	156		26.3	r	46.8	r	41.0	r	9.0	r	4.5	r	10.3
Wood products	321	191		43.5		82.2		79.1		6.3	r	1.6		4.7
Paper	322	18		72.2		55.6		61.1		33.3		D		33.3
Printing and related support activities	323	385		29.6		37.4		37.4		31.2		4.4		33.8
Petroleum and coal products	324	4		D		D		D		D		D		D
Chemicals	325	262		34.4		52.3		68.3		25.6		15.6		8.8
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	0		0.0		0.0		0.0		0.0		0.0		0.0
Pharmaceuticals and medicines	3254	40		30.0		60.0		70.0		7.5		40.0	r	17.5
Soap, cleaning compound, and toilet preparation manufacturing	3256	48		27.1		52.1		50.0	r	45.8	r	D		D
Other chemicals	other 325	174		37.9		50.0	r	72.4		23.6	r	12.6	r	6.3
Plastics and rubber products	326	236		47.0		64.8		73.7		26.7		16.5	r	5.5
Nonmetallic mineral products	327	131		29.8		56.5		40.5		8.4	r	17.6		17.6
Primary metals	331	50		62.0		36.0		78.0		30.0	r	10.0		D
Fabricated metal products	332	1,517		38.4		52.0		51.2		27.4		16.0		10.9
Machinery	333	887		36.4		30.3		63.5		27.5		13.0	r	11.0
Computer and electronic products	334	442		34.8		31.7		56.6		23.1		11.1		21.5
Communications equipment	3342	55		60.0		29.1		52.7	r	30.9	r	D		D
Semiconductor and other electronic components	3344	111		24.3		34.2		83.8		10.8	r	15.3	r	15.3
Navigational, measuring, electromedical, and control instruments	3345	194		23.7		32.5		44.3		17.0		11.9	r	31.4
Other computer and electronic products	other 334	83		57.8		30.1	r	50.6		49.4		D		10.8
Electrical equipment, appliances, and components	335	212		18.4		29.2	r	31.1		49.1		5.7	r	12.3
Transportation equipment	336	349		25.8		33.8	r	27.8		24.1	r	18.1	r	30.4
Automobiles, bodies, trailers, and parts	3361–63	293		23.2		33.1	r	21.8		22.9	r	20.5	r	33.1
Aerospace products and parts	3364	35		54.3	r	45.7	r	74.3		25.7	r	D		14.3
Other transportation	other 336	19		21.1		36.8	r	31.6	r	31.6	r	0.0		D
Furniture and related products	337	382		69.4		48.2		79.1		27.5	r	30.4		5.2
Miscellaneous	339	666		44.3		59.5		56.3		25.7		6.9		9.9
Medical equipment and supplies	3391	284		47.9		54.9		56.3		38.0	r	8.8	r	7.7
Other miscellaneous manufacturing	3399	383		41.3		62.9		56.7		16.7		6.0		11.7
Nonmanufacturing industries	11, 21–23, 42–81	134,833		27.1		36.6		49.2		23.8		11.7		18.4
Agriculture, forestry, fishing, and hunting	11	300	r	68.3		32.7		27.0	r	D		0.0		0.0
Mining, extraction, and support activities	21	258		31.8	r	38.0	r	40.3		8.9	r	1.2	r	5.0
Utilities	22	65		36.9		27.7	r	84.6		18.5	r	D		D
Construction	23	10,274		23.5		35.1		45.0		20.1		12.7		20.6
Wholesale trade	42	5,293		26.0		35.4		44.1		24.5		9.4		19.2

TABLE 94

**Motivation for artificial intelligence technology adoption and utilization for companies using the technology, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To automate tasks performed by labor	To upgrade outdated processes or methods	To improve quality or reliability of processes or methods	To expand the range of goods or services	To adopt standards and accreditation	Some other reason
Retail trade	44–45	13,168	21.8	35.7	43.6	30.2	13.7	17.3
Transportation and warehousing	48–49	3,527	18.1	34.6	48.8	15.6	15.0	20.9
Information	51	4,039	36.9	42.0	52.9	38.1	5.6	17.5
Publishing	511	1,331	31.4	40.6	45.8	35.4	3.3	27.2
Newspaper, periodical, book, and directory publishers	5111	361	37.7 r	65.9	54.6	29.4	2.2 r	20.2
Software publishers	5112	970	29.0	31.1	42.5	37.7	3.6	30.0
Telecommunications	517	275	42.2	37.5	44.7	30.2	4.0	20.0
Data processing, hosting, and related services	518	1,168	40.2	40.6	60.7	43.1	9.4	12.6 r
Other information	other 51	1,263	38.7	45.7	54.9	37.8	4.8	11.1
Finance and insurance	52	8,784	28.8	42.4	56.0	25.1	12.2	14.4
Real estate and rental and leasing	53	8,541	27.8	37.1	45.4	14.7	10.7	20.4
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0.0	0.0	0.0	0.0	0.0	0.0
Other real estate and rental and leasing	other 53	8,541	27.8	37.1	45.4	14.7	10.7	20.4
Professional, scientific, and technical services	54	38,008	31.9	36.5	53.0	26.9	8.7	16.3
Legal services	5411	5,965	29.6	37.7	39.4	13.3	7.4	24.2
Accounting, tax preparation, bookkeeping, and payroll services	5412	4,980	40.2	43.2	55.9	14.7	7.5	8.6
Architectural, engineering, and related services	5413	3,046	23.9	31.7	56.5	22.5	14.6	14.6
Specialized design services	5414	1,174	21.4	32.9	42.1	35.0	8.2 r	22.0
Computer systems design and related services	5415	11,681	33.9	38.1	61.6	37.7	6.7	15.0
Management, scientific, and technical consulting services	5416	6,676	28.9	32.4	49.5	27.8	11.4	16.3
Scientific research and development services	5417	861	26.5	27.3	56.1	28.3	9.3	28.3
Advertising, public relations, and related services	5418	1,365	28.3	34.9	54.6	40.9	6.9	11.1
Other professional, scientific, and technical services	5419	2,263	37.8	34.5	47.0	24.3	9.9	16.3
Management of companies and enterprises	55	91 r	0.0	D	D	96.7	0.0	0.0
Administrative and support and waste management and remediation services	56	7,687	27.1	37.5	45.2	22.5	6.6	21.6
Educational services	61	1,564	27.6	43.5	39.6	25.8	9.1 r	21.2
Health care and social assistance	62	16,796	24.8	35.2	54.5	17.8	21.1	19.1
Health care services	621–23	15,746	25.7	35.4	55.8	17.9	21.7	17.5
Social assistance	624	1,051	12.0	32.9	35.7	15.9	12.1	43.3
Arts, entertainment, and recreation	71	1,442	17.3 r	35.7	43.6	19.0	7.1 r	34.3
Accommodation and food services	72	8,936	23.5	34.4	46.3	21.3	12.1	20.2
Other services	81	6,055	23.3	36.0	41.8	24.3	13.2	20.7

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

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. Industry classification is based on dominant establishment payroll. Statistics are representative of companies located in the United States that reported a low, moderate, or high use of the technology (see [Table 84](#)).

**Source(s):**

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

TABLE 95

**Impact of artificial intelligence 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	141,159	15.0	6.3	78.7	41.0	1.8	57.2	31.2	1.1	39.8	27.9	
Manufacturing industries	31–33	6,327	12.7	10.0	77.3	41.7	2.4	55.9	35.8	2.1	42.5	19.7	
Food	311	323	21.3	r 21.5	57.2	32.8	D	66.3	30.0	D	54.5	14.6	r
Beverage and tobacco products	312	120	28.3		65.9	46.7	D	50.8	30.3	0.0	43.7	26.0	
Textile, apparel, and leather products	313–16	156	10.9	r 5.1	r 84.0	64.1	D	35.3	31.4	r D	19.9	r 48.7	r
Wood products	321	191	6.3	r 4.7	r 89.0	32.3	r 0.0	67.7	10.5	0.0	50.8	38.7	r
Paper	322	18	D	D	94.4	38.9	D	61.1	22.2	0.0	77.8	D	
Printing and related support activities	323	385	8.1	7.5	84.5	19.7	0.0	80.3	10.9	0.0	31.8	57.3	
Petroleum and coal products	324	4	D	0.0	D	D	0.0	D	D	0.0	D	0.0	
Chemicals	325	262	24.4	6.1	r 69.5	40.2	5.0	r 54.9	40.5	D	47.7	11.1	
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Pharmaceuticals and medicines	3254	40	7.5	D	85.0	20.0	r 0.0	80.0	32.5	r 0.0	62.5	D	
Soap, cleaning compound, and toilet preparation manufacturing	3256	48	16.7	r D	62.5	25.0	D	58.3	20.8	r 0.0	41.7	r 37.5	r
Other chemicals	other 325	174	28.7	3.4	67.9	49.4	D	49.4	46.6	D	46.6	6.9	
Plastics and rubber products	326	236	15.1	r 5.8	79.1	45.3	D	54.7	54.2	D	34.7	8.1	
Nonmetallic mineral products	327	131	11.6	r 8.5	r 80.0	30.5	r D	65.6	20.8	0.0	59.3	20.0	
Primary metals	331	50	12.2	0.0	87.8	46.9	r 0.0	53.1	32.0	r 0.0	48.0	20.0	r
Fabricated metal products	332	1,517	6.5	14.3	r 79.2	46.4	3.2	r 50.4	34.6	2.6	r 44.1	18.7	
Machinery	333	887	15.3	3.3	81.4	43.3	D	55.5	54.8	D	36.0	8.3	r
Computer and electronic products	334	442	22.1	5.7	r 72.2	42.1	D	57.5	38.4	2.0	r 52.4	7.2	
Communications equipment	3342	55	D	D	63.6	53.7	0.0	46.3	r 43.6	r 0.0	47.3	r 9.1	
Semiconductor and other electronic components	3344	111	9.0	r D	87.4	29.1	0.0	70.9	25.2	D	64.0	8.1	r
Navigational, measuring, electromedical, and control instruments	3345	194	31.4	D	66.5	36.6	D	62.4	41.2	D	55.7	D	
Other computer and electronic products	other 334	83	21.7	r D	75.9	65.5	0.0	34.5	r 47.0	D	34.9	r 16.9	r
Electrical equipment, appliances, and components	335	212	13.7	r 5.2	r 81.1	40.6	r D	58.0	64.5	0.0	27.6	r 7.9	
Transportation equipment	336	349	11.7	r 2.3	86.0	35.2	D	63.3	28.9	r 0.0	39.6	r 31.5	r
Automobiles, bodies, trailers, and parts	3361–63	293	10.6	r D	89.1	33.1	D	66.9	26.5	r 0.0	39.1	r 34.4	r
Aerospace products and parts	3364	35	20.0	D	68.6	58.3	r 0.0	41.7	r 52.9	r 0.0	38.2	r 8.9	
Other transportation	other 336	19	D	D	78.9	31.6	r D	52.6	19.1	r 0.0	47.6	r 33.3	r
Furniture and related products	337	382	14.7	36.4	49.0	55.8	D	29.6	44.2	D	35.1	7.6	

TABLE 95

**Impact of artificial intelligence 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	666	9.5	6.5	84.1	39.2	D	60.2	22.7	D	50.5	24.5	
Medical equipment and supplies	3391	284	10.2	12.3	r 77.6	55.3	D	43.3	25.0	D	29.6	39.8	
Other miscellaneous manufacturing	3399	383	8.9	D	88.8	27.0	0.0	73.0	21.0	0.0	65.9	13.1	r
Nonmanufacturing industries	11, 21–23, 42–81	134,833	15.1	6.1	78.8	40.9	1.8	57.3	31.0	1.0	39.7	28.3	
Agriculture, forestry, fishing, and hunting	11	300	r D	D	69.3	0.0	0.0	100.0	0.0	0.0	49.0	r 51.0	r
Mining, extraction, and support activities	21	258	D	5.8	r 73.3	49.0	0.0	51.0	52.3	0.0	38.8	8.9	r
Utilities	22	65	11.0	r 0.0	89.0	23.5	r 0.0	76.5	17.2	r 0.0	67.2	r 15.6	r
Construction	23	10,274	21.1	6.2	72.7	45.2	D	54.3	32.5	0.0	41.3	26.2	
Wholesale trade	42	5,293	12.5	8.7	78.8	40.5	2.8	56.7	32.0	D	38.7	28.4	
Retail trade	44–45	13,168	13.7	7.8	78.5	39.2	3.1	57.7	22.3	2.3	45.4	30.0	
Transportation and warehousing	48–49	3,527	16.9	9.0	74.1	36.5	2.0	r 61.5	24.3	D	37.8	37.6	
Information	51	4,039	19.7	5.9	74.4	41.9	0.2	r 57.9	44.2	0.2	r 40.6	14.9	
Publishing	511	1,331	21.6	4.3	r 74.0	38.5	D	60.9	39.7	D	45.3	14.4	
Newspaper, periodical, book, and directory publishers	5111	361	11.1	r 11.1	r 77.9	34.6	D	64.5	27.4	D	47.9	23.3	
Software publishers	5112	970	25.7	1.5	r 72.8	40.0	D	59.5	44.2	D	44.2	11.0	r
Telecommunications	517	275	19.3	D	80.7	28.4	0.0	71.6	24.9	0.0	51.7	23.5	
Data processing, hosting, and related services	518	1,168	26.5	10.1	r 63.4	54.9	0.0	45.1	57.8	0.0	32.8	9.4	
Other information	other 51	1,263	11.4	4.8	83.8	36.5	D	63.3	40.7	D	40.6	18.8	
Finance and insurance	52	8,784	12.4	8.4	79.2	46.8	1.6	r 51.6	35.3	D	38.4	26.3	
Real estate and rental and leasing	53	8,541	9.0	3.0	88.0	28.8	1.5	r 69.7	21.1	D	37.2	40.7	
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other real estate and rental and leasing	other 53	8,541	9.0	3.0	88.0	28.8	1.5	r 69.7	21.1	D	37.2	40.7	
Professional, scientific, and technical services	54	38,008	15.4	3.6	81.0	43.5	0.4	56.1	39.2	0.2	r 37.7	22.9	
Legal services	5411	5,965	9.4	5.9	84.7	30.2	D	69.7	16.4	0.0	36.2	47.5	
Accounting, tax preparation, bookkeeping, and payroll services	5412	4,980	10.1	6.0	83.9	35.4	1.5	r 63.1	33.3	D	38.9	27.0	
Architectural, engineering, and related services	5413	3,046	20.5	3.4	76.1	48.7	0.3	r 51.0	45.8	D	43.3	10.6	
Specialized design services	5414	1,174	D	D	99.6	31.0	0.0	69.0	19.7	0.0	43.0	37.4	
Computer systems design and related services	5415	11,681	18.7	3.0	78.3	51.9	0.2	r 47.9	52.9	0.3	r 36.8	10.0	
Management, scientific, and technical consulting services	5416	6,676	17.9	1.6	r 80.5	44.8	D	55.1	42.9	D	34.3	22.8	
Scientific research and development services	5417	861	30.8	3.4	65.8	49.9	1.2	r 48.9	56.0	D	36.7	7.0	
Advertising, public relations, and related services	5418	1,365	17.2	2.3	80.5	48.4	1.2	50.4	30.2	D	37.2	32.5	
Other professional, scientific, and technical services	5419	2,263	12.5	3.7	r 83.8	43.3	0.0	56.7	30.1	0.0	44.9	25.0	



TABLE 95

**Impact of artificial intelligence 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	91	r	D	0.0	41.8	r	D	0.0	D	D	0.0	41.8	r	0.0			
Administrative and support and waste management and remediation services	56	7,687				18.3		6.5	75.2	43.4	1.7	r	54.9	27.2	D	38.9	33.3	
Educational services	61	1,564				9.6		11.1	79.3	42.8	D		54.4	20.9		0.0	42.6	36.6
Health care and social assistance	62	16,796				13.7		4.1	82.2	37.8	2.0		60.2	30.9	1.0	r	41.5	26.7
Health care services	621–23	15,746				13.5		4.1	82.4	38.2	1.8		60.0	30.8	0.8	r	42.1	26.4
Social assistance	624	1,051				15.9		D	79.8	31.4	D		64.3	31.4	D		33.1	31.3
Arts, entertainment, and recreation	71	1,442		r	6.4	r	81.2		30.7	6.6	r	62.7	15.0	D		50.0	31.7	
Accommodation and food services	72	8,936				17.7		12.6	69.7	43.2	7.2		49.6	24.0	6.5		31.5	37.9
Other services	81	6,055				14.4		9.0	76.6	37.6	D		61.1	20.1	D		47.6	31.6

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

TABLE 96

**Impact of artificial intelligence 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	141,159	9.8	3.3	52.5	34.4	7.1	3.8	63.6	25.5	7.6	2.6	66.5	23.3	8.3	3.5	65.9	22.3											
Manufacturing industries	31–33	6,327	14.1	8.7	67.1	10.1	11.1	4.7	75.1	9.1	8.3	3.8	79.8	8.1	9.8	5.9	74.8	9.5											
Food	311	323	14.7	r	18.4	62.9	4.0	r	28.3	r	1.5	63.6	6.6	r	9.6	r	D	84.8	4.0	r	9.0	r	10.5	r	73.0	7.4	r		
Beverage and tobacco products	312	120	19.0		15.7	53.7	11.6	r	25.0		10.0	r	60.0	D	16.4	r	0.0	73.7	9.8	r	11.7	r	15.8		66.7	D			
Textile, apparel, and leather products	313–16	156	9.0	r	D	84.6	6.4		31.9	r	4.5	r	63.6	D	7.7		D	89.7	0.0		3.8		4.5	r	90.4	D			
Wood products	321	191	8.4	r	3.1	88.4	0.0		D		D		95.3	2.6	r	D	D	97.9	D		D		3.1		94.8	D			
Paper	322	18	D		D	72.2	D		D		0.0		100.0	0.0		D	0.0	100.0	0.0		D		D		77.8	0.0			
Printing and related support activities	323	385	5.7		6.0	84.2	4.2		4.9		5.5	r	71.4	18.3	r	3.4		D	88.6	6.8		4.4		D		88.8	5.7		
Petroleum and coal products	324	4	D		0.0	D	0.0		D		0.0		D	0.0		D		D	0.0	0.0		D		0.0		D	0.0		
Chemicals	325	262	19.1		8.4	r	58.8	13.7	r	13.8		13.8	r	64.0	8.4	r	23.8	r	2.7	r	65.1	8.4	r	19.1		D	71.0	8.4	r
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	0	0.0		0.0	0.0	0.0		0.0		0.0		0.0	0.0		0.0		0.0	0.0		0.0		0.0		0.0		0.0	0.0	
Pharmaceuticals and medicines	3254	40	D		0.0	77.5	12.5	r	D		D		77.5	10.0	r	0.0		D	77.5	10.0	r	D		0.0		80.0	10.0	r	
Soap, cleaning compound, and toilet preparation manufacturing	3256	48	10.4	r	D	45.8	r	D		D		0.0	64.6	D		18.8	r	0.0	54.2	r	D		10.4	r	0.0	60.4	D		
Other chemicals	other 325	174	23.6		8.6	r	57.5	D		16.7	r	19.5	r	60.3	D		30.5	r	D		64.4	D		23.6		D	71.8	D	
Plastics and rubber products	326	236	20.2	r	5.9	69.7	4.2	r	23.8	r	5.4		67.5	3.3	r	15.8	r	2.1	r	77.9	4.2	r	23.5	r	4.7	66.4	5.5	r	
Nonmetallic mineral products	327	131	5.3	r	D	87.8	D		6.9	r	3.8		84.7	D		8.4	r	D	87.0	D		8.4	r	D		85.5	D		
Primary metals	331	50	10.0		D	80.0	D		16.0	r	D		76.0	D		D		D	86.0	D		10.0		D		80.0	D		

TABLE 96

**Impact of artificial intelligence 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	
Fabricated metal products	332	1,517	18.1	10.3	r 62.6	9.0	r 5.3	2.1	85.2	7.4	6.5	r 2.4	r 85.6	5.5	5.8	r 6.4	r 77.8	10.0	
Machinery	333	887	7.7	2.7	76.3	13.3	r 9.4	r 1.4	r 81.7	7.6	r 4.4	r 1.2	r 80.2	14.2	r 11.0	1.6	r 68.2	19.2	r
Computer and electronic products	334	442	15.2	6.1	r 62.7	16.1	19.7	5.9	r 64.8	9.5	13.0	2.3	r 74.7	10.0	r 17.1	3.8	r 68.9	10.2	r
Communications equipment	3342	55	D	0.0	80.0	14.5	r D	D	56.4	D	0.0	D	85.5	D	D	D	85.5	D	
Semiconductor and other electronic components	3344	111	7.3	r 10.9	r 62.8	19.1	r 11.7	D	77.5	3.6	r 11.6	r 0.0	69.7	18.7	r 8.1	r D	72.1	D	
Navigational, measuring, electromedical, and control instruments	3345	194	28.4	7.2	r 53.1	11.3	25.5	r 4.1	r 60.2	10.2	r 21.6	r 4.6	r 67.5	D	31.4	5.2	r 57.7	D	
Other computer and electronic products	other 334	83	D	0.0	72.3	24.1	r 15.9	r 0.0	63.4	20.7	r D	0.0	91.6	D	D	0.0	79.5	18.1	r
Electrical equipment, appliances, and components	335	212	28.3	r D	56.6	7.1	r 14.5	r 4.7	r 68.6	12.2	10.8	4.7	r 76.5	8.0	r 17.9	r D	67.5	8.0	r
Transportation equipment	336	349	11.5	r 1.7	58.3	28.6	r 11.2	r D	59.6	28.7	r 8.9	r D	62.2	28.1	r 10.9	r D	70.8	17.2	r
Automobiles, bodies, trailers, and parts	3361–63	293	10.9	r D	56.7	32.1	r 11.6	r D	55.3	32.4	r 10.2	r D	57.3	32.1	r 10.6	r D	70.0	19.1	r
Aerospace products and parts	3364	35	22.9	D	71.4	D	14.7	0.0	85.3	0.0	D	0.0	94.3	0.0	14.3	0.0	85.7	0.0	
Other transportation	other 336	19	D	D	57.9	r D	0.0	0.0	73.7	r D	0.0	0.0	73.7	r D	D	0.0	63.2	r D	
Furniture and related products	337	382	15.4	32.3	48.3	3.9	r 11.3	28.2	r 56.6	3.9	r 10.7	27.5	r 58.9	D	7.6	r 28.3	r 59.6	4.5	r
Miscellaneous	339	666	13.1	7.1	r 68.0	11.8	6.2	1.1	r 82.8	9.9	7.1	4.7	r 81.1	7.1	9.0	4.5	r 80.0	6.5	
Medical equipment and supplies	3391	284	16.3	r 10.8	r 62.4	10.5	r 6.3	r D	78.5	13.7	r 9.9	r D	75.4	6.0	r 6.0	r D	83.1	D	
Other miscellaneous manufacturing	3399	383	11.1	4.4	71.8	12.7	r 6.3	D	86.2	7.3	r 5.2	D	85.9	7.8	r 11.5	2.6	r 78.1	7.8	r



TABLE 96

**Impact of artificial intelligence 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
Other real estate and rental and leasing	other 53	8,541	6.6	1.5	r 46.3	45.6	5.5	D	57.0	36.6	5.3	D	58.2	35.5	5.5	2.9	56.2	35.4
Professional, scientific, and technical services	54	38,008	9.4	1.0	47.5	42.1	7.8	2.2	62.0	28.0	6.9	0.9	63.4	28.8	8.1	1.4	63.6	26.9
Legal services	5411	5,965	5.1	0.5	r 42.1	52.3	3.5	2.5	r 60.2	33.8	5.0	0.0	62.3	32.7	4.0	1.6	r 63.3	31.1
Accounting, tax preparation, bookkeeping, and payroll services	5412	4,980	10.1	1.1	r 41.9	46.9	4.5	3.8	r 68.1	23.6	2.1	r 1.5	r 66.1	30.3	5.0	1.9	r 72.0	21.1
Architectural, engineering, and related services	5413	3,046	15.8	1.4	42.9	39.8	14.6	2.9	r 52.8	29.7	9.6	2.0	r 60.4	28.0	10.2	1.0	61.7	27.1
Specialized design services	5414	1,174	D	D	52.0	47.6	D	D	61.9	33.5	0.0	0.0	65.8	34.2	0.0	D	62.3	37.6
Computer systems design and related services	5415	11,681	10.5	1.5	54.0	34.0	8.6	2.1	64.7	24.6	8.4	0.9	r 68.8	21.9	9.5	1.2	66.9	22.4
Management, scientific, and technical consulting services	5416	6,676	9.8	D	49.1	40.9	9.8	0.3	r 60.5	29.4	10.1	1.2	r 54.5	34.2	11.9	0.9	r 54.4	32.8
Scientific research and development services	5417	861	11.7	1.4	r 45.8	41.0	19.2	1.5	63.3	16.1	11.6	1.3	r 69.8	17.3	17.4	1.5	60.8	20.2
Advertising, public relations, and related services	5418	1,365	7.6	r 1.8	45.9	44.8	11.3	1.0	53.6	34.1	5.8	0.7	60.0	33.5	7.8	0.9	62.3	29.0
Other professional, scientific, and technical services	5419	2,263	9.1	D	40.7	48.4	4.6	r 3.8	r 60.5	31.1	4.1	r D	60.2	35.6	5.7	r 3.6	r 60.6	30.1
Management of companies and enterprises	55	91	r 0.0	0.0	D	D	D	0.0	41.8	r 0.0	D	0.0	41.8	r 0.0	0.0	0.0	100.0	0.0
Administrative and support and waste management and remediation services	56	7,687	11.9	2.9	47.8	37.4	8.0	5.2	60.4	26.4	8.6	2.9	64.3	24.2	11.2	2.4	r 63.4	23.0

TABLE 96

**Impact of artificial intelligence 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							
Educational services	61	1,564	8.0	r	D	38.7	50.4	6.4	r	D	51.7	36.4	9.9		D	62.7	24.6	16.8	r	10.9	52.2	20.1			
Health care and social assistance	62	16,796	7.8		3.0	52.0	37.2	2.6		3.4	67.8	26.2	5.0		2.3	68.1	24.6	5.6		4.5	69.2	20.7			
Health care services	621–23	15,746	7.0		2.7	53.3	37.0	2.8		3.4	68.2	25.6	4.5		2.2	68.9	24.4	5.7		4.0	69.7	20.6			
Social assistance	624	1,051	19.7		D	32.6	39.5	0.0		D	60.6	35.2	12.0	r	D	56.3	27.3	D		12.4	r	60.1	23.5		
Arts, entertainment, and recreation	71	1,442	D		D	49.2	50.6	0.6		D	61.6	37.7	D		3.6	r	71.8	21.8	3.5	r	6.8	r	67.9	21.8	
Accommodation and food services	72	8,936	15.1		8.2	57.9	18.8	6.4		10.2	61.3	22.1	9.9		6.3	68.1	15.7	7.8		8.2	64.7	19.3			
Other services	81	6,055	5.1		3.3	r	56.9	34.7	3.8	r	3.2	r	60.7	32.3	3.1	r	2.8	65.4	28.7	2.2	r	3.5	r	66.7	27.6

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

TABLE 97

**Motivation for cloud-based computing systems and applications technology adoption and utilization for companies using the technology, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To automate tasks performed by labor	To upgrade outdated processes or methods	To improve quality or reliability of processes or methods	To expand the range of goods or services	To adopt standards and accreditation	Some other reason
All industries	11, 21–23, 31–33, 42–81	1,549,065	15.6	43.3	49.2	14.1	10.4	23.5
Manufacturing industries	31–33	62,089	13.5	47.4	45.9	12.1	9.6	24.7
Food	311	4,433	14.5	41.7	44.8	10.2	9.9	29.1
Beverage and tobacco products	312	3,754	15.4	44.1	45.8	11.0	8.5	24.1
Textile, apparel, and leather products	313–16	2,586	13.0	44.9	44.0	9.6	6.0	30.6
Wood products	321	2,002	10.3	44.0	36.9	9.5	2.9	38.1
Paper	322	785	14.0 r	54.9	61.9	19.5	13.2 r	13.4
Printing and related support activities	323	8,725	13.0	47.2	44.8	14.8	7.1	27.0
Petroleum and coal products	324	235	28.5 r	44.3	25.5 r	8.1 r	14.0 r	27.7 r
Chemicals	325	2,484	18.6	49.8	50.3	12.0	10.5	18.8
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	194	26.8 r	54.1 r	54.1 r	0.0	D	10.3 r
Pharmaceuticals and medicines	3254	520	19.8	57.5	54.0	13.7	18.3	18.5
Soap, cleaning compound, and toilet preparation manufacturing	3256	560	14.3	44.8	42.1	21.3 r	7.5	25.0
Other chemicals	other 325	1,211	18.7	48.1	51.9	9.2	6.9	17.7
Plastics and rubber products	326	2,722	11.6	55.8	55.0	13.0	15.7	18.7
Nonmetallic mineral products	327	1,720	8.2	51.7	42.7	7.3	8.3	27.0
Primary metals	331	826	7.9	54.0	34.4	5.4	16.7 r	26.5
Fabricated metal products	332	10,845	11.8	46.7	46.3	7.5	10.4	23.9
Machinery	333	5,611	16.7	51.0	45.4	11.7	15.5	20.9
Computer and electronic products	334	3,186	12.9	40.8	46.2	25.0	10.3	23.2
Communications equipment	3342	332	8.7	45.5	64.2	41.0	11.1 r	16.3
Semiconductor and other electronic components	3344	1,019	9.3	46.4	44.9	20.5	11.4	23.2
Navigational, measuring, electromedical, and control instruments	3345	1,270	14.9	35.5	44.7	25.1	10.6	26.5
Other computer and electronic products	other 334	566	17.0	39.2	41.3	23.9	7.2	20.0
Electrical equipment, appliances, and components	335	1,287	15.5	55.9	49.3	9.9	6.3	19.9
Transportation equipment	336	1,908	16.5	47.3	52.7	12.4	12.0	21.4
Automobiles, bodies, trailers, and parts	3361–63	1,250	18.2	45.6	54.0	12.3	12.0 r	18.2
Aerospace products and parts	3364	336	16.4	52.4	50.0	15.2	13.7	26.8
Other transportation	other 336	322	10.2	48.8	50.0	9.3 r	10.9	28.0
Furniture and related products	337	2,612	16.9	51.5	44.3	13.1	7.8	25.7
Miscellaneous	339	6,366	12.1	46.2	45.3	15.3	7.2	24.4
Medical equipment and supplies	3391	2,037	13.7	47.9	44.8	22.6	13.2	22.0
Other miscellaneous manufacturing	3399	4,328	11.3	45.5	45.5	11.9	4.4	25.6
Nonmanufacturing industries	11, 21–23, 42–81	1,486,975	15.7	43.1	49.4	14.1	10.4	23.5
Agriculture, forestry, fishing, and hunting	11	3,162	20.5	47.6	30.7	D	2.7 r	28.0
Mining, extraction, and support activities	21	2,902	15.3	46.7	41.5	4.2 r	4.2 r	34.1

TABLE 97

**Motivation for cloud-based computing systems and applications technology adoption and utilization for companies using the technology, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To automate tasks performed by labor	To upgrade outdated processes or methods	To improve quality or reliability of processes or methods	To expand the range of goods or services	To adopt standards and accreditation	Some other reason
Utilities	22	863	19.1	32.0	54.6	8.2	2.9	22.1
Construction	23	138,956	13.2	43.5	45.1	9.4	5.9	26.4
Wholesale trade	42	77,394	12.4	45.2	47.2	12.4	6.2	24.3
Retail trade	44–45	131,408	14.3	44.1	46.9	13.9	7.7	23.2
Transportation and warehousing	48–49	35,253	13.7	44.6	49.4	11.1	8.4	24.5
Information	51	35,649	19.2	41.4	57.7	28.7	10.4	20.4
Publishing	511	10,769	18.8	47.3	58.3	32.5	10.3	18.6
Newspaper, periodical, book, and directory publishers	5111	5,125	13.0	48.1	51.7	14.9	4.2	21.9
Software publishers	5112	5,641	24.0	46.7	64.2	48.6	15.8	15.5
Telecommunications	517	3,512	26.0	39.4	58.4	26.9	10.1	22.2
Data processing, hosting, and related services	518	6,317	28.2	48.5	62.9	41.7	18.0	16.3
Other information	other 51	15,053	14.2	34.6	54.9	21.0	7.2	23.0
Finance and insurance	52	97,142	16.9	47.9	55.7	13.9	11.5	18.4
Real estate and rental and leasing	53	96,310	15.2	43.3	50.9	10.1	7.6	23.4
Lessors of nonfinancial intangible assets (except copyrighted works)	533	807	24.3	r 68.5	73.2	19.1	D	D
Other real estate and rental and leasing	other 53	95,502	15.1	43.1	50.7	10.0	7.7	23.6
Professional, scientific, and technical services	54	363,059	16.8	42.7	52.4	20.0	9.4	23.9
Legal services	5411	79,712	14.3	43.9	50.4	9.0	7.3	28.8
Accounting, tax preparation, bookkeeping, and payroll services	5412	57,578	16.0	40.4	50.3	19.9	9.6	23.4
Architectural, engineering, and related services	5413	40,928	14.6	40.1	49.6	14.3	7.5	26.0
Specialized design services	5414	13,714	13.5	39.6	47.7	15.4	7.4	27.4
Computer systems design and related services	5415	63,324	22.4	45.8	61.6	41.6	15.9	17.3
Management, scientific, and technical consulting services	5416	64,022	19.1	41.6	52.0	18.4	8.0	23.0
Scientific research and development services	5417	4,188	16.6	37.8	55.9	21.2	14.4	26.7
Advertising, public relations, and related services	5418	15,388	14.9	45.0	53.3	19.1	6.2	21.7
Other professional, scientific, and technical services	5419	24,167	13.1	43.7	46.9	17.2	8.7	24.3
Management of companies and enterprises	55	806	13.2	r 52.7	61.9	21.3	r D	5.1
Administrative and support and waste management and remediation services	56	85,414	17.8	46.3	50.5	12.9	7.5	21.9
Educational services	61	23,127	16.3	40.7	50.3	16.7	8.9	26.1
Health care and social assistance	62	202,410	16.2	40.4	48.9	9.6	24.5	22.3
Health care services	621–23	184,835	15.8	40.0	48.5	9.1	25.5	22.6
Social assistance	624	17,574	20.6	44.7	53.4	14.6	14.4	19.5



TABLE 97

**Motivation for cloud-based computing systems and applications technology adoption and utilization for companies using the technology, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To automate tasks performed by labor	To upgrade outdated processes or methods	To improve quality or reliability of processes or methods	To expand the range of goods or services	To adopt standards and accreditation	Some other reason
Arts, entertainment, and recreation	71	28,512	12.8	36.0	47.0	12.8	5.4	27.1
Accommodation and food services	72	94,504	16.4	43.2	43.2	11.7	7.9	23.9
Other services	81	70,105	14.8	40.6	43.8	14.0	7.6	24.7

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. Detail may exceed total because companies could select more than one response. Industry classification is based on dominant establishment payroll. Statistics are representative of companies located in the United States that reported a low, moderate, or high use of the technology (see [Table 86](#)).

**Source(s):**

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

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 &gt; 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.

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

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	
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	76.8	13.3	13.0	1.0	75.7	10.3	6.0	1.6	83.8	8.6	8.9	1.5	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	2.1	74.4	13.8	11.7	0.0	84.1	4.2	5.7	D	85.5	5.7	13.6	D	79.8	5.1	
Semiconductor and other electronic components	3344	1,019	5.2	3.1	78.9	12.8	7.5	4.0	83.3	5.2	5.6	2.0	82.4	10.0	2.1	6.1	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	75.7	12.9	6.1	4.3	82.2	7.3	
Other computer and electronic products	other 334	566	7.6	2.3	72.0	18.1	6.5	3.4	73.4	16.8	3.2	0.9	78.8	17.1	4.2	3.5	76.9	15.4	
Electrical equipment, appliances, and components	335	1,287	12.9	3.8	74.2	9.2	12.4	3.3	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	8.3	2.4	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	6.8	5.4	77.2	10.6	6.9	3.6	78.9	10.6	7.0	2.8	79.6	10.6	
Aerospace products and parts	3364	336	19.9	D	69.3	9.8	14.0	D	79.2	6.3	13.3	0.0	76.0	10.6	14.9	D	78.3	5.1	
Other transportation	other 336	322	20.3	4.3	68.9	6.5	8.4	7.5	78.9	5.3	9.0	D	81.7	8.7	11.6	0.0	80.2	8.2	
Furniture and related products	337	2,612	6.9	3.8	76.4	12.9	8.6	3.9	76.3	11.2	4.4	3.9	77.6	14.1	5.3	2.6	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	73.3	9.8	6.0	1.6	79.3	13.1	7.9	0.9	80.8	10.4	7.3	1.6	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	

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					
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			

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
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



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
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 &gt; 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.

TABLE 100

**Motivation for specialized software technology adoption and utilization for companies using the technology, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To automate tasks performed by labor		To upgrade outdated processes or methods		To improve quality or reliability of processes or methods		To expand the range of goods or services		To adopt standards and accreditation		Some other reason
All industries	11, 21–23, 31–33, 42–81	1,818,697	19.8		43.5		50.9		15.3		11.9		19.4
Manufacturing industries	31–33	88,457	23.1		48.4		55.1		18.3		10.1		16.6
Food	311	4,753	17.1		46.0		51.9		10.8		10.3		21.1
Beverage and tobacco products	312	3,363	20.2		44.5		57.2		12.7		10.9		17.2
Textile, apparel, and leather products	313–16	3,283	16.5		47.0		47.1		16.3		7.4		21.8
Wood products	321	3,209	36.4		46.9		50.2		14.5		6.2		17.0
Paper	322	1,033	33.5		57.7		52.0		14.7	r	12.5		19.3
Printing and related support activities	323	10,799	19.1		50.6		51.5		19.9		6.0		16.5
Petroleum and coal products	324	201	36.8	r	82.1		48.8	r	9.0	r	6.0		10.4
Chemicals	325	2,942	24.6		43.1		63.1		13.6		14.3		12.8
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	189	39.7	r	70.9		69.3		25.9	r	24.3	r	D
Pharmaceuticals and medicines	3254	572	28.3		47.7		59.8		14.5		25.0		13.3
Soap, cleaning compound, and toilet preparation manufacturing	3256	548	16.6		44.5		57.5		11.7		11.7		19.5
Other chemicals	other 325	1,631	24.2		37.8		65.6		12.6		10.5		11.4
Plastics and rubber products	326	3,745	22.8		55.4		58.9		16.4		16.8		19.0
Nonmetallic mineral products	327	2,209	21.8		53.9		47.8		13.0		7.0		14.8
Primary metals	331	1,042	15.5		41.5		63.8		8.4		11.1	r	13.3
Fabricated metal products	332	20,037	23.8		48.9		55.6		15.6		11.7		15.9
Machinery	333	8,900	25.9		48.5		63.6		23.0		11.4		13.8
Computer and electronic products	334	4,631	22.1		39.9		58.4		27.8		11.0		18.7
Communications equipment	3342	574	19.2		40.2		68.3		36.9		12.9	r	12.2
Semiconductor and other electronic components	3344	1,427	27.7		45.0		62.4		24.7		12.8		18.8
Navigational, measuring, electromedical, and control instruments	3345	1,928	19.9		35.8		55.5		28.8		10.5		21.2
Other computer and electronic products	other 334	703	19.1		40.3		50.5		23.8		7.4		16.8
Electrical equipment, appliances, and components	335	1,872	24.8		50.6		49.5		26.9		9.6		17.0
Transportation equipment	336	2,758	26.8		51.5		57.8		19.7		14.6		17.3
Automobiles, bodies, trailers, and parts	3361–63	1,766	28.7		54.3		60.8		20.8		13.9		14.7
Aerospace products and parts	3364	476	24.4		50.8		57.6		21.6		19.1		22.7
Other transportation	other 336	515	21.9		42.5		48.0		13.8		12.8	r	21.4
Furniture and related products	337	5,208	28.6		44.7		53.2		14.2		6.4		17.0
Miscellaneous	339	8,474	20.5		49.8		52.6		27.3		8.8		15.4
Medical equipment and supplies	3391	3,192	29.6		48.9		57.7		37.0		11.2		10.8
Other miscellaneous manufacturing	3399	5,281	14.9		50.3		49.5		21.5		7.3		18.2
Nonmanufacturing industries	11, 21–23, 42–81	1,730,242	19.6		43.2		50.7		15.2		12.0		19.5
Agriculture, forestry, fishing, and hunting	11	4,216	19.1		47.8		45.1		10.2		5.3		18.9
Mining, extraction, and support activities	21	3,992	15.0		41.0		44.1		7.3		3.4	r	22.6
Utilities	22	1,058	23.9		39.2		49.2		9.4		10.8	r	18.5

TABLE 100

**Motivation for specialized software technology adoption and utilization for companies using the technology, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To automate tasks performed by labor	To upgrade outdated processes or methods	To improve quality or reliability of processes or methods	To expand the range of goods or services	To adopt standards and accreditation	Some other reason
Construction	23	153,792	16.5	45.3	46.3	10.6	7.0	22.4
Wholesale trade	42	80,452	16.1	46.4	49.2	14.0	7.7	19.2
Retail trade	44–45	169,897	17.1	44.9	48.3	14.6	9.3	18.7
Transportation and warehousing	48–49	41,847	18.4	44.9	46.3	11.5	11.0	20.1
Information	51	36,310	22.5	45.4	55.1	27.1	9.9	17.6
Publishing	511	10,789	22.5	48.9	57.2	28.2	8.1	17.3
Newspaper, periodical, book, and directory publishers	5111	5,223	15.9	50.6	50.7	18.2	3.8	19.7
Software publishers	5112	5,565	28.7	47.3	63.2	37.5	12.2	15.1
Telecommunications	517	3,218	26.6	44.7	54.1	21.6	9.4	18.1
Data processing, hosting, and related services	518	6,165	34.6	49.9	58.1	38.1	15.2	13.4
Other information	other 51	16,138	17.2	41.4	52.8	23.4	9.2	19.2
Finance and insurance	52	108,580	23.6	46.8	58.2	18.8	13.6	14.9
Real estate and rental and leasing	53	101,319	19.9	45.0	51.7	12.6	9.8	18.1
Lessors of nonfinancial intangible assets (except copyrighted works)	533	669	23.0 r	53.4	46.2	19.0 r	16.4 r	D
Other real estate and rental and leasing	other 53	100,648	19.9	44.9	51.8	12.5	9.7	18.2
Professional, scientific, and technical services	54	397,321	22.6	40.7	53.7	20.3	11.3	20.0
Legal services	5411	84,212	22.9	44.9	54.0	8.6	7.8	20.8
Accounting, tax preparation, bookkeeping, and payroll services	5412	75,646	23.3	32.7	51.3	16.3	12.7	22.8
Architectural, engineering, and related services	5413	57,394	21.4	40.1	52.1	22.4	13.5	20.6
Specialized design services	5414	14,719	15.0	39.7	48.5	19.8	10.0	25.4
Computer systems design and related services	5415	61,904	27.8	45.7	58.3	35.4	15.0	16.6
Management, scientific, and technical consulting services	5416	55,062	22.8	40.9	53.3	23.9	9.3	17.8
Scientific research and development services	5417	4,838	21.2	33.6	58.2	23.8	16.1	23.6
Advertising, public relations, and related services	5418	13,660	20.4	47.0	54.7	23.9	7.5	14.3
Other professional, scientific, and technical services	5419	29,847	16.2	38.4	54.9	19.4	11.3	19.6
Management of companies and enterprises	55	764	6.9 r	50.0	62.7	D	D	12.7 r
Administrative and support and waste management and remediation services	56	92,899	21.0	46.3	52.2	14.2	9.0	20.2
Educational services	61	23,595	21.9	45.7	53.4	17.2	9.8	18.3
Health care and social assistance	62	259,822	19.3	40.5	50.9	11.3	25.3	18.8
Health care services	621–23	240,008	19.1	40.3	50.6	11.4	26.0	18.8
Social assistance	624	19,813	21.3	43.3	53.8	10.5	16.5	19.3
Arts, entertainment, and recreation	71	32,812	15.3	39.4	46.6	17.3	6.7	23.7
Accommodation and food services	72	114,110	17.5	45.0	45.1	10.7	8.1	20.1

TABLE 100

**Motivation for specialized software technology adoption and utilization for companies using the technology, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To automate tasks performed by labor	To upgrade outdated processes or methods	To improve quality or reliability of processes or methods	To expand the range of goods or services	To adopt standards and accreditation	Some other reason
Other services	81	107,459	17.5	40.2	46.8	14.9	8.4	21.4

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. Detail may exceed total because companies could select more than one response. Industry classification is based on dominant establishment payroll. Statistics are representative of companies located in the United States that reported a low, moderate, or high use of the technology (see [Table 88](#)).

**Source(s):**

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

TABLE 101

**Impact of specialized software 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	1,818,697	9.5	3.2	87.3	25.2	0.8	74.0	14.2	0.5	43.1	42.2
Manufacturing industries	31–33	88,457	11.4	4.4	84.2	29.2	1.3	69.5	20.1	0.5	53.8	25.6
Food	311	4,753	10.5	5.1	84.4	22.8	2.3	r 74.9	11.3	1.1	r 49.7	37.8
Beverage and tobacco products	312	3,363	11.6	2.7	85.7	27.4	0.8	r 71.8	17.2	0.4	r 48.5	34.0
Textile, apparel, and leather products	313–16	3,283	5.3	5.6	89.1	21.0	1.0	r 78.0	10.4	0.5	41.0	48.0
Wood products	321	3,209	14.6	5.9	79.5	22.7	3.8	r 73.5	14.5	D	54.6	30.7
Paper	322	1,033	12.5	r 2.3	r 85.2	31.8	0.0	68.2	23.8	0.0	41.7	34.4
Printing and related support activities	323	10,799	7.4	5.2	87.4	26.1	0.9	73.0	11.8	0.6	r 45.4	42.2
Petroleum and coal products	324	201	5.5	D	93.0	43.0	0.0	57.0	11.5	r 0.0	68.9	19.6
Chemicals	325	2,942	13.4	3.6	83.0	32.3	0.2	r 67.5	23.7	D	57.2	18.7
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	189	3.2	r D	95.8	16.7	r 0.0	83.3	4.7	0.0	52.1	43.2
Pharmaceuticals and medicines	3254	572	13.2	2.3	84.5	30.1	D	69.8	28.2	D	60.6	11.2
Soap, cleaning compound, and toilet preparation manufacturing	3256	548	6.2	D	92.3	29.3	0.0	70.7	14.6	0.0	52.4	33.0
Other chemicals	other 325	1,631	17.0	5.1	77.9	35.9	D	63.8	27.2	D	58.2	13.7
Plastics and rubber products	326	3,745	16.9	4.1	79.0	27.2	D	72.7	18.0	D	65.8	16.0
Nonmetallic mineral products	327	2,209	12.1	5.0	82.9	23.1	0.5	76.4	15.2	0.0	54.7	30.1
Primary metals	331	1,042	9.0	3.0	r 88.0	26.2	0.8	r 73.0	18.9	D	66.0	14.3
Fabricated metal products	332	20,037	13.0	3.2	83.8	31.2	1.5	67.3	22.4	0.1	58.7	18.8
Machinery	333	8,900	12.7	4.5	82.8	35.1	2.0	62.9	31.4	1.3	r 56.4	10.9
Computer and electronic products	334	4,631	11.4	3.4	85.2	32.1	0.5	r 67.4	26.7	0.2	r 61.6	11.5
Communications equipment	3342	574	9.6	1.2	89.2	29.3	0.0	70.7	30.0	D	59.8	9.8
Semiconductor and other electronic components	3344	1,427	12.1	4.3	83.6	31.7	D	67.1	24.1	0.0	64.8	11.1
Navigational, measuring, electromedical, and control instruments	3345	1,928	11.7	3.5	84.8	34.6	0.4	r 65.0	29.0	0.4	r 60.2	10.4
Other computer and electronic products	other 334	703	10.4	2.8	r 86.8	27.9	0.0	72.1	22.4	0.0	60.9	16.7
Electrical equipment, appliances, and components	335	1,872	13.5	4.5	82.0	31.0	0.7	68.3	27.6	0.3	r 60.2	11.9
Transportation equipment	336	2,758	16.4	3.6	80.0	31.5	1.1	r 67.4	27.2	0.8	r 54.9	17.1
Automobiles, bodies, trailers, and parts	3361–63	1,766	13.1	4.1	82.8	31.3	1.5	r 67.2	26.0	1.0	r 53.7	19.3
Aerospace products and parts	3364	476	25.1	3.2	71.7	35.9	D	64.1	34.1	0.0	56.3	9.7
Other transportation	other 336	515	19.0	r 2.3	78.7	27.8	D	71.5	24.3	D	58.4	16.3
Furniture and related products	337	5,208	10.7	4.9	84.4	29.0	1.0	70.0	19.6	0.3	49.0	31.0

TABLE 101

**Impact of specialized software 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	8,474	8.9	6.7	84.4	31.2	1.4	r	67.4	19.4	0.5	49.4	30.7		
Medical equipment and supplies	3391	3,192	12.0	8.6	79.4	43.9	1.3		54.8	33.2	0.7	r	42.9	23.2	
Other miscellaneous manufacturing	3399	5,281	7.1	5.5	87.4	23.5	1.4	r	75.1	11.1	0.4	r	53.3	35.2	
Nonmanufacturing industries	11, 21–23, 42–81	1,730,242	9.4	3.2	87.4	25.0	0.8		74.2	13.9	0.5		42.6	43.0	
Agriculture, forestry, fishing, and hunting	11	4,216	6.7	2.2	r 91.1	22.2		D	77.8	12.0	0.0		40.0	48.0	
Mining, extraction, and support activities	21	3,992	3.2	4.0	92.8	24.2	1.5	r	74.3	14.7	1.4	r	57.8	26.1	
Utilities	22	1,058	4.1	2.1	93.8	22.5	0.5		77.0	11.6	0.5		61.6	26.3	
Construction	23	153,792	12.0	2.9	85.1	23.8	0.8		75.4	14.5	0.4		46.8	38.3	
Wholesale trade	42	80,452	11.0	4.2	84.8	26.3	1.2		72.5	13.6	0.7		47.1	38.7	
Retail trade	44–45	169,897	8.6	3.9	87.5	23.0	1.0		76.0	11.5	0.8		41.7	46.1	
Transportation and warehousing	48–49	41,847	11.3	3.9	84.8	23.1	0.9		76.0	11.6	0.4		40.5	47.6	
Information	51	36,310	9.5	4.6	85.9	28.8	0.7		70.5	19.7	0.3		47.3	32.7	
Publishing	511	10,789	10.9	6.0	83.1	28.9	1.0	r	70.1	21.6	0.4		51.0	27.0	
Newspaper, periodical, book, and directory publishers	5111	5,223	3.0	9.3	87.7	22.2	1.6	r	76.2	10.7	0.6	r	46.4	42.3	
Software publishers	5112	5,565	18.2	2.9	78.9	35.2	0.4	r	64.4	31.8	0.3	r	55.2	12.7	
Telecommunications	517	3,218	12.4	6.6	81.0	33.5	1.4	r	65.1	25.5	0.1		47.0	27.3	
Data processing, hosting, and related services	518	6,165	17.5	4.3	78.2	34.9	0.6	r	64.5	28.7	0.3	r	51.2	19.8	
Other information	other 51	16,138	4.9	3.4	91.7	25.4	0.3		74.3	13.8	0.4		43.4	42.4	
Finance and insurance	52	108,580	8.3	2.6	89.1	28.3	0.6		71.1	13.7	0.4		41.3	44.6	
Real estate and rental and leasing	53	101,319	6.8	2.7	90.5	20.4	0.6		79.0	8.5	0.3		36.6	54.6	
Lessors of nonfinancial intangible assets (except copyrighted works)	533	669	8.5	r	D	83.0	7.3	r	D	84.0	7.3	r	D	44.4	39.6
Other real estate and rental and leasing	other 53	100,648	6.8	2.6	90.6	20.5	0.5		79.0	8.6	0.2		36.6	54.6	
Professional, scientific, and technical services	54	397,321	8.6	2.4	89.0	27.0	0.5		72.5	18.9	0.2		44.2	36.6	
Legal services	5411	84,212	6.1	2.3	91.6	18.5	0.4		81.1	7.3	0.1	r	31.0	61.6	
Accounting, tax preparation, bookkeeping, and payroll services	5412	75,646	7.4	2.9	89.7	23.2	0.8		76.0	14.8	0.3		47.5	37.4	
Architectural, engineering, and related services	5413	57,394	10.0	2.4	87.6	33.6	0.3		66.1	31.3	0.2		55.9	12.6	
Specialized design services	5414	14,719	7.7	1.7	90.6	28.3		D	71.6	13.5	0.0		30.9	55.6	
Computer systems design and related services	5415	61,904	11.0	2.0	87.0	34.5	0.3		65.2	29.6	0.3		51.0	19.1	
Management, scientific, and technical consulting services	5416	55,062	9.3	2.4	88.3	28.6	0.4		71.0	20.9	0.5		41.2	37.5	
Scientific research and development services	5417	4,838	13.7	1.7	84.6	32.2	0.5	r	67.3	34.5	0.5	r	55.3	9.7	
Advertising, public relations, and related services	5418	13,660	9.6	3.9	86.5	27.3	0.7	r	72.0	12.4	0.3		38.8	48.5	
Other professional, scientific, and technical services	5419	29,847	9.3	2.1	88.6	27.3	0.6	r	72.1	15.4		D	49.6	34.8	

**TABLE 101**  
**Impact of specialized software 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	764	D	D	85.9	13.9	r	0.0	86.1	D	0.0	50.3	42.7
Administrative and support and waste management and remediation services	56	92,899	13.6	3.4	83.0	25.9		0.9	73.2	11.4	0.3	39.0	49.3
Educational services	61	23,595	13.4	2.9	83.7	26.6		1.1	72.3	14.0	1.1	32.7	52.2
Health care and social assistance	62	259,822	9.6	2.6	87.8	25.9		0.5	73.6	14.3	0.3	46.1	39.3
Health care services	621–23	240,008	9.1	2.8	88.1	25.7		0.5	73.8	14.7	0.3	47.5	37.5
Social assistance	624	19,813	15.3	1.1	r 83.6	27.7		0.4	r 71.9	9.5	D	29.2	61.3
Arts, entertainment, and recreation	71	32,812	7.0	2.7	90.3	20.7		0.9	78.4	7.3	0.5	r 34.7	57.5
Accommodation and food services	72	114,110	8.6	4.8	86.6	18.5		2.2	79.3	7.6	1.3	36.4	54.7
Other services	81	107,459	8.9	4.2	86.9	27.1		1.0	71.9	13.5	0.5	39.3	46.7

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.

TABLE 102

**Impact of specialized software 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	1,818,697	5.5	1.4	53.6	39.5	4.4	1.6	66.4	27.6	4.2	1.0	68.0	26.8	5.1	1.5	68.6	24.8	
Manufacturing industries	31–33	88,457	10.1	3.6	77.4	8.9	7.8	2.3	80.5	9.4	5.9	1.8	82.2	10.1	6.7	2.1	81.1	10.1	
Food	311	4,753	8.4	3.0	80.3	8.3	5.2	4.5	80.2	10.1	7.1	2.3	81.7	8.9	4.6	4.3	83.0	8.1	
Beverage and tobacco products	312	3,363	8.5	1.2	77.8	12.5	9.3	1.3	81.5	7.9	9.3	0.6	79.5	10.6	8.2	1.7	r 81.6	8.5	
Textile, apparel, and leather products	313–16	3,283	5.9	3.7	76.7	13.7	4.7	4.4	74.2	16.7	3.2	3.0	r 76.0	17.8	4.0	3.8	r 75.7	16.5	
Wood products	321	3,209	13.7	7.2	73.9	5.2	10.0	2.0	80.6	7.4	7.4	2.0	83.9	6.7	9.3	2.1	79.3	9.3	
Paper	322	1,033	9.5	r 6.8	r 77.3	6.4	r 11.1	r D	77.0	11.2	r 3.4	r D	90.2	5.9	r 9.1	r 0.0	85.0	5.9	r
Printing and related support activities	323	10,799	6.8	4.4	78.8	10.0	4.9	2.3	80.1	12.7	3.5	1.3	78.4	16.8	3.7	1.4	78.8	16.1	
Petroleum and coal products	324	201	5.5	0.0	94.5	0.0	4.0	r D	95.0	0.0	2.0	D	96.5	0.0	2.0	D	96.5	0.0	
Chemicals	325	2,942	11.5	3.3	78.5	6.7	12.8	2.8	r 78.7	5.7	8.1	0.7	r 85.2	6.0	10.8	0.8	82.8	5.6	
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	189	D	D	92.6	D	D	0.0	86.8	12.2	r D	0.0	88.4	D	D	D	85.7	D	
Pharmaceuticals and medicines	3254	572	13.6	2.6	r 77.9	5.9	12.8	1.2	84.3	1.7	r 6.5	1.4	89.3	2.8	r 10.0	1.0	r 86.2	2.8	r
Soap, cleaning compound, and toilet preparation manufacturing	3256	548	6.2	D	76.1	15.5	r 9.9	D	74.5	13.5	r 6.9	D	79.4	13.3	r 5.3	D	78.3	14.2	r
Other chemicals	other 325	1,631	13.9	4.0	r 78.1	4.0	15.3	4.0	r 77.1	3.6	10.1	r D	85.3	3.9	14.0	D	82.7	3.1	
Plastics and rubber products	326	3,745	13.9	4.9	78.4	2.8	14.6	3.5	r 78.0	3.9	10.9	3.1	r 82.5	3.5	12.0	3.6	r 79.8	4.6	
Nonmetallic mineral products	327	2,209	10.1	3.3	78.2	8.4	8.7	2.2	80.2	8.9	7.4	1.0	r 84.5	7.1	6.7	2.7	r 81.6	9.0	
Primary metals	331	1,042	6.0	2.0	83.7	8.3	r 5.4	1.4	85.1	8.1	r 4.9	1.1	85.6	8.4	r 4.3	1.8	r 84.3	9.6	r



TABLE 102

## Impact of specialized software 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	
Fabricated metal products	332	20,037	11.7	3.1	77.7	7.5	8.3	1.4	83.1	7.2	7.3	1.6	83.9	7.2	7.2	1.6	83.7	7.5	
Machinery	333	8,900	9.1	2.9	r 76.8	11.2	7.6	1.3	r 82.3	8.8	4.3	2.1	r 82.8	10.8	6.2	1.6	82.3	9.9	
Computer and electronic products	334	4,631	8.0	2.5	78.1	11.4	6.8	3.2	82.2	7.8	5.3	2.3	83.4	9.0	5.0	3.0	83.4	8.6	
Communications equipment	3342	574	5.4	1.2	r 79.3	14.1	4.9	1.6	86.0	7.5	r 5.6	D	88.2	6.1	r 5.1	1.4	88.3	5.2	r
Semiconductor and other electronic components	3344	1,427	10.8	2.5	r 77.5	9.2	8.3	3.6	81.0	7.1	6.9	3.4	82.0	7.7	4.3	4.1	r 83.8	7.8	
Navigational, measuring, electromedical, and control instruments	3345	1,928	7.2	3.2	79.0	10.6	6.2	3.3	84.0	6.5	5.0	2.6	82.4	10.0	5.8	3.3	82.1	8.8	
Other computer and electronic products	other 334	703	6.4	1.8	r 76.1	15.7	7.3	r 3.0	r 76.6	13.1	2.4	r 0.9	85.1	11.5	4.1	r 1.6	82.0	12.2	
Electrical equipment, appliances, and components	335	1,872	11.1	3.0	r 77.8	8.1	11.9	1.1	r 81.0	6.0	5.6	1.5	86.0	6.9	10.0	1.2	81.9	6.9	
Transportation equipment	336	2,758	16.7	2.9	73.2	7.2	10.1	4.2	r 78.3	7.4	6.8	3.7	r 81.2	8.3	11.2	2.2	78.9	7.7	
Automobiles, bodies, trailers, and parts	3361–63	1,766	13.5	3.4	76.0	7.1	r 7.8	4.8	r 79.4	8.0	r 4.3	4.6	r 83.5	7.6	r 9.2	2.3	r 81.3	7.1	r
Aerospace products and parts	3364	476	22.3	2.1	r 68.4	7.1	15.4	2.7	r 76.2	5.7	10.0	r 2.3	r 77.7	10.0	r 14.6	2.9	r 72.5	10.0	
Other transportation	other 336	515	22.2	r 1.6	r 68.7	7.4	12.9	r 4.1	r 76.0	7.0	12.8	r 1.9	76.4	8.9	14.8	r D	77.3	7.2	
Furniture and related products	337	5,208	11.3	4.3	74.7	9.7	7.5	3.5	76.4	12.6	4.1	1.8	r 83.0	11.1	6.5	3.4	79.1	11.0	
Miscellaneous	339	8,474	9.5	4.4	75.9	10.2	5.3	2.2	79.1	13.4	4.3	1.5	r 80.3	13.9	5.3	2.3	77.5	14.9	
Medical equipment and supplies	3391	3,192	17.0	5.1	68.5	9.4	5.4	2.1	r 77.4	15.1	5.7	1.4	r 80.0	12.9	5.8	2.5	74.0	17.7	
Other miscellaneous manufacturing	3399	5,281	5.1	4.0	80.3	10.6	5.2	2.3	r 80.1	12.4	3.5	1.6	r 80.3	14.6	4.9	2.1	79.9	13.1	

TABLE 102

**Impact of specialized software 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				
Nonmanufacturing industries	11, 21–23, 42–81	1,730,242	5.3	1.3	52.4	41.0	4.2	1.6	65.7	28.5	4.1	0.9	67.4	27.6	5.0	1.4	68.0	25.6				
Agriculture, forestry, fishing, and hunting	11	4,216	6.3	D	66.3	26.1	2.0	r	D	68.4	28.4	4.2	D	69.4	25.1	4.5	0.0	69.9	25.6			
Mining, extraction, and support activities	21	3,992	1.7	2.0	r	72.2	24.1	0.7	0.5	84.5	14.3	0.6	1.6	r	81.3	16.5	1.5	r	1.7	r	82.3	14.5
Utilities	22	1,058	2.2	0.6	62.3	34.9	2.0	1.0	70.6	26.4	2.6	0.9	71.9	24.6	3.2	1.2	74.1	21.5				
Construction	23	153,792	8.4	1.1	61.4	29.1	5.1	2.0	69.6	23.3	7.1	1.0	72.9	19.0	6.4	1.2	73.8	18.6				
Wholesale trade	42	80,452	6.2	1.7	55.7	36.4	7.3	2.3	71.6	18.8	5.4	1.3	73.3	20.0	6.1	2.2	71.7	20.0				
Retail trade	44–45	169,897	4.4	1.8	54.6	39.2	4.3	1.9	69.7	24.1	3.9	1.1	71.9	23.1	4.6	1.6	73.3	20.5				
Transportation and warehousing	48–49	41,847	6.3	1.1	46.3	46.2	5.6	1.7	61.3	31.4	5.7	0.9	65.1	28.3	5.8	1.8	66.1	26.3				
Information	51	36,310	5.1	2.5	57.1	35.3	5.2	2.3	67.5	25.0	5.0	1.7	69.1	24.2	6.6	2.0	66.8	24.6				
Publishing	511	10,789	5.1	3.3	60.5	31.1	6.7	2.7	70.8	19.8	5.9	3.6	71.5	19.0	8.3	2.7	70.6	18.4				
Newspaper, periodical, book, and directory publishers	5111	5,223	2.0	5.8	63.5	28.7	2.4	r	3.5	71.5	22.6	1.4	5.9	70.0	22.7	3.5	4.2	70.6	21.7			
Software publishers	5112	5,565	8.1	1.0	r	57.6	33.3	10.7	2.0	70.1	17.2	10.1	1.5	r	72.9	15.5	12.8	1.2	70.7	15.3		
Telecommunications	517	3,218	5.5	3.8	r	56.0	34.7	4.6	5.2	73.0	17.2	5.5	2.6	r	76.0	15.9	6.6	4.4	71.8	17.2		
Data processing, hosting, and related services	518	6,165	10.2	2.3	55.1	32.4	11.2	1.5	67.9	19.4	9.1	0.9	72.6	17.4	13.8	1.5	66.7	18.0				
Other information	other 51	16,138	3.0	1.9	55.7	39.4	1.9	1.7	64.3	32.1	2.9	0.5	64.7	31.9	2.7	1.3	63.2	32.8				
Finance and insurance	52	108,580	4.7	1.2	50.0	44.1	4.3	1.6	65.5	28.6	2.9	0.8	65.4	30.9	4.4	1.3	67.3	27.0				
Real estate and rental and leasing	53	101,319	3.1	0.8	42.8	53.3	3.1	1.1	57.1	38.7	3.0	0.6	58.2	38.2	3.3	1.3	57.8	37.6				
Lessors of nonfinancial intangible assets (except copyrighted works)	533	669	0.0	0.0	49.5	50.5	8.7	r	D	48.9	33.8	D	D	72.5	10.6	r	D	D	80.7	10.6	r	

TABLE 102

**Impact of specialized software 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
Other real estate and rental and leasing	other 53	100,648	3.1	0.8	42.8	53.3	3.0	1.0	57.2	38.8	2.9	0.5	58.2	38.4	3.3	1.2	57.7	37.8
Professional, scientific, and technical services	54	397,321	4.7	1.1	49.0	45.2	3.7	1.2	63.6	31.5	3.1	0.6	63.4	32.9	4.6	1.2	64.3	29.9
Legal services	5411	84,212	3.0	0.8	38.1	58.1	2.6	1.3	58.9	37.2	2.2	0.5	56.5	40.8	3.5	1.3	61.9	33.3
Accounting, tax preparation, bookkeeping, and payroll services	5412	75,646	3.3	1.1	45.6	50.0	2.9	1.0	63.1	33.0	1.7	0.4	62.5	35.4	3.3	1.3	64.8	30.6
Architectural, engineering, and related services	5413	57,394	6.5	0.9	60.9	31.7	4.3	1.1	70.9	23.7	3.6	0.4	74.2	21.8	4.8	0.9	72.4	21.9
Specialized design services	5414	14,719	4.1	0.7	44.2	51.0	1.2	D	54.9	43.6	1.4	D	50.7	47.9	2.3	D	51.4	46.2
Computer systems design and related services	5415	61,904	6.7	0.9	57.6	34.8	4.8	0.9	67.3	27.0	4.2	0.8	68.7	26.3	6.1	1.0	66.9	26.0
Management, scientific, and technical consulting services	5416	55,062	5.1	1.4	45.3	48.3	5.1	1.6	58.6	34.7	4.2	1.2	58.5	36.1	6.0	1.5	57.4	35.1
Scientific research and development services	5417	4,838	7.2	1.0	57.5	34.3	6.5	1.3	75.4	16.8	6.6	1.1	76.3	16.0	8.8	1.2	75.0	15.0
Advertising, public relations, and related services	5418	13,660	4.9	2.3	51.1	41.7	5.3	2.5	62.3	29.9	3.6	1.1	64.9	30.4	4.9	2.1	63.0	30.0
Other professional, scientific, and technical services	5419	29,847	4.3	1.2	55.1	39.4	3.3	1.4	68.2	27.1	3.8	0.7	66.0	29.5	4.7	0.9	67.7	26.7
Management of companies and enterprises	55	764	D	D	33.2	59.6	D	0.0	66.2	27.0	0.0	D	61.1	32.2	D	0.0	66.2	27.0
Administrative and support and waste management and remediation services	56	92,899	8.3	1.7	51.0	39.0	5.9	2.2	63.5	28.4	6.6	1.3	66.8	25.3	7.6	1.4	66.0	25.0

TABLE 102

**Impact of specialized software 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			
Educational services	61	23,595	3.5	0.6	r	38.9	57.0	5.4	0.4	r	59.0	35.2	4.9	0.5	r	61.0	33.6	7.0	1.0	62.4	29.6
Health care and social assistance	62	259,822	4.8	1.0		51.0	43.2	4.0	1.2		66.6	28.2	3.6	0.8		68.3	27.3	4.8	1.2	69.6	24.4
Health care services	621–23	240,008	4.6	1.0		52.4	42.0	3.8	1.2		67.5	27.5	3.4	0.8		68.5	27.3	4.6	1.2	70.0	24.2
Social assistance	624	19,813	6.2	0.9	r	35.2	57.7	5.7	1.0		56.4	36.9	6.5	1.4	r	65.0	27.1	7.6	1.1	64.5	26.8
Arts, entertainment, and recreation	71	32,812	2.2	1.6		42.8	53.4	3.5	1.7		58.5	36.3	3.3	1.4		59.3	36.0	3.9	1.6	62.4	32.1
Accommodation and food services	72	114,110	5.7	2.1		60.1	32.1	3.2	2.4		67.3	27.1	4.6	1.9		73.4	20.1	4.4	2.7	72.5	20.4
Other services	81	107,459	6.2	1.6		58.5	33.7	3.0	1.3		66.8	28.9	3.4	0.5		67.9	28.2	4.5	1.4	68.6	25.5

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

TABLE 103

**Motivation for robotics technology adoption and utilization for companies using the technology, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To automate tasks performed by labor		To upgrade outdated processes or methods		To improve quality or reliability of processes or methods		To expand the range of goods or services		To adopt standards and accreditation		Some other reason	
All industries	11, 21–23, 31–33, 42–81	88,422	40.1		32.5		45.2		24.5		8.6		21.1	
Manufacturing industries	31–33	20,540	59.6		41.5		57.0		23.8		9.8		10.9	
Food	311	1,051	65.9		39.2		51.2		20.4		4.2		4.6	
Beverage and tobacco products	312	423	74.5		49.6		60.0		11.8		16.5	r	5.0	r
Textile, apparel, and leather products	313–16	378	56.6		38.4		53.7		7.4		D		18.8	r
Wood products	321	650	59.7		42.3		48.9		13.8		7.1	r	18.5	r
Paper	322	311	61.1		33.1	r	53.1		21.5	r	0.0		16.4	r
Printing and related support activities	323	680	44.0		26.0		40.9		20.6		1.3	r	21.6	r
Petroleum and coal products	324	23	34.8		73.9	r	30.4		D		D		26.1	
Chemicals	325	628	66.1		40.1		57.6		12.4		9.1		14.2	
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	40	75.0		32.5	r	35.0	r	D		D		D	
Pharmaceuticals and medicines	3254	143	67.1		42.0		58.7		15.4	r	16.1	r	7.0	r
Soap, cleaning compound, and toilet preparation manufacturing	3256	158	60.8	r	53.2	r	55.1	r	8.2	r	D		34.8	r
Other chemicals	other 325	288	67.4		34.0		61.5		13.2		9.7		8.7	r
Plastics and rubber products	326	1,817	69.6		48.2		73.0		23.7		12.6		12.5	
Nonmetallic mineral products	327	476	69.1		60.9		62.0		17.4	r	6.1	r	7.8	
Primary metals	331	532	64.5		37.4		42.5		7.3		18.4	r	3.9	
Fabricated metal products	332	5,100	54.8		40.0		51.3		24.5		6.0		10.7	
Machinery	333	3,190	63.2		42.4		58.8		33.3		15.6		9.5	
Computer and electronic products	334	1,318	50.2		29.1		54.1		22.5		11.8	r	16.4	
Communications equipment	3342	75	24.0		13.3		66.7		10.7	r	D		D	
Semiconductor and other electronic components	3344	498	66.9		34.9		52.0		23.5		7.6		12.0	r
Navigational, measuring, electromedical, and control instruments	3345	589	39.4		26.1		54.8		24.1		16.8	r	19.4	
Other computer and electronic products	other 334	156	50.0		28.8		51.3		18.6		10.3	r	19.9	
Electrical equipment, appliances, and components	335	432	68.5		46.3		56.5		28.0		5.3		22.7	r
Transportation equipment	336	1,157	66.2		47.7		66.9		21.3		17.2		4.5	
Automobiles, bodies, trailers, and parts	3361–63	940	69.4		47.2		68.9		21.6		18.6		2.4	
Aerospace products and parts	3364	155	52.9		51.0		63.9		24.5		12.9	r	11.0	r
Other transportation	other 336	62	51.6	r	46.8	r	43.5	r	8.1		D		21.0	
Furniture and related products	337	881	63.2		51.4		58.7		19.5		14.8	r	6.0	
Miscellaneous	339	1,492	46.5		40.2		66.9		34.4		8.2		9.0	
Medical equipment and supplies	3391	854	44.4		38.2		65.2		37.6		8.4		5.6	
Other miscellaneous manufacturing	3399	639	49.5		42.9		68.9		30.2		8.0	r	13.3	
Nonmanufacturing industries	11, 21–23, 42–81	67,883	34.2		29.8		41.7		24.7		8.3		24.2	
Agriculture, forestry, fishing, and hunting	11	259	78.0		20.8	r	D		D		D		D	
Mining, extraction, and support activities	21	233	59.7	r	12.9		36.9	r	5.2	r	2.6	r	1.7	
Utilities	22	36	47.2	r	38.9	r	50.0		13.9		D		8.3	
Construction	23	7,354	33.5		36.4		41.3		22.5		8.0		22.2	
Wholesale trade	42	5,924	39.5		30.0		44.1		21.8		4.3		20.0	

TABLE 103

**Motivation for robotics technology adoption and utilization for companies using the technology, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To automate tasks performed by labor	To upgrade outdated processes or methods	To improve quality or reliability of processes or methods	To expand the range of goods or services	To adopt standards and accreditation	Some other reason
Retail trade	44–45	10,449	43.7	29.7	44.0	23.1	6.8	16.3
Transportation and warehousing	48–49	983	25.4	15.6	33.6	9.6 r	4.0 r	37.5
Information	51	1,513	25.1	27.4	37.5	33.6	8.7	28.7
Publishing	511	409	30.3 r	21.3	37.9	25.9	5.9	33.0 r
Newspaper, periodical, book, and directory publishers	5111	97	22.7 r	43.3 r	35.1 r	D	16.5 r	28.9 r
Software publishers	5112	312	33.0 r	14.1 r	38.5	31.7	3.2	34.0 r
Telecommunications	517	110	19.1 r	22.7 r	28.2 r	44.5	D	21.8 r
Data processing, hosting, and related services	518	316	18.4	22.8	38.3	32.3	10.4 r	35.1
Other information	other 51	676	25.7	34.3	39.1	37.1	10.1 r	24.3
Finance and insurance	52	1,529	35.6	34.7	39.2	17.1	11.8	31.7
Real estate and rental and leasing	53	1,244	34.3	30.6	35.5	30.2	D	20.7
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0.0	0.0	0.0	0.0	0.0	0.0
Other real estate and rental and leasing	other 53	1,244	34.3	30.6	35.5	30.2	D	20.7
Professional, scientific, and technical services	54	15,401	37.4	29.0	38.8	28.7	7.6	29.0
Legal services	5411	384	15.4 r	17.2 r	16.1 r	D	0.0	57.6
Accounting, tax preparation, bookkeeping, and payroll services	5412	423	64.5	15.1 r	23.2 r	20.8 r	9.7 r	30.5
Architectural, engineering, and related services	5413	7,090	41.9	34.5	43.8	29.8	7.3	23.6
Specialized design services	5414	414	14.5 r	26.3 r	40.3 r	51.0	D	24.2
Computer systems design and related services	5415	3,134	29.1	29.8	32.2	31.0	10.4	38.0
Management, scientific, and technical consulting services	5416	2,057	34.0	21.3	39.3	27.2	3.5	32.4
Scientific research and development services	5417	980	51.6	24.2	46.3	22.2	10.6	21.4
Advertising, public relations, and related services	5418	323	29.4	16.4 r	33.4	19.8	D	30.7 r
Other professional, scientific, and technical services	5419	596	30.4	19.6	28.0	31.5	15.9 r	29.2
Management of companies and enterprises	55	97 r	D	D	99.0	0.0	0.0	D
Administrative and support and waste management and remediation services	56	2,630	30.7	21.3	38.3	24.9	10.2	28.1
Educational services	61	581	14.8 r	D	D	43.7	D	48.9
Health care and social assistance	62	11,349	22.4	30.4	50.1	28.5	12.8	21.1
Health care services	621–23	11,050	22.6	30.6	50.8	29.0	12.9	20.3
Social assistance	624	299	D	D	D	D	D	49.8
Arts, entertainment, and recreation	71	753	19.9 r	25.5 r	40.0	32.4	D	28.2
Accommodation and food services	72	3,433	32.2	29.3	26.1	11.7	7.6	37.2
Other services	81	4,110	32.6	30.9	45.9	20.8	7.3	22.7

D = withheld to avoid disclosing data for individual companies; data are included in higher-level totals. r = relative standard error &gt; 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 that reported a low, moderate, or high use of the technology (see [Table 90](#)).

**Source(s):**

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

TABLE 104

**Impact of robotics 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	88,422	10.0	8.1	81.9	23.7	2.3	74.0	20.3	1.6	54.5	23.6
Manufacturing industries	31–33	20,540	11.8	13.6	74.6	28.5	2.7	68.8	24.4	2.0	59.4	14.2
Food	311	1,051	11.8	r 29.6	58.6	30.2	1.0	68.8	15.9	0.7	61.3	22.2
Beverage and tobacco products	312	423	25.5	24.3	r 50.2	49.9	D	48.5	36.2	D	46.8	14.9
Textile, apparel, and leather products	313–16	378	9.3	r 21.2	r 69.5	30.2	D	56.9	21.5	0.0	41.6	36.9
Wood products	321	650	1.2	20.5	r 78.3	24.6	D	75.4	22.8	D	54.0	23.1
Paper	322	311	3.9	7.4	88.7	9.0	D	89.7	8.0	D	59.2	32.5
Printing and related support activities	323	680	11.9	r 9.0	r 79.2	25.9	0.0	74.1	17.2	0.0	38.4	44.3
Petroleum and coal products	324	23	D	D	78.3	r 21.7	D	65.2	r 18.2	0.0	81.8	r 0.0
Chemicals	325	628	13.0	9.9	77.1	33.3	D	66.7	22.3	D	68.3	9.4
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	40	0.0	12.8	87.2	D	0.0	85.0	D	0.0	50.0	r D
Pharmaceuticals and medicines	3254	143	6.3	r 14.0	r 79.7	32.9	D	67.1	33.4	r D	61.0	5.6
Soap, cleaning compound, and toilet preparation manufacturing	3256	158	4.3	6.9	r 88.7	45.2	r 0.0	54.8	r 11.4	0.0	78.5	10.1
Other chemicals	other 325	288	22.7	10.0	r 67.2	29.4	0.0	70.6	25.5	0.0	67.9	6.6
Plastics and rubber products	326	1,817	15.6	20.4	64.1	32.7	4.1	r 63.2	29.8	3.5	r 54.2	12.5
Nonmetallic mineral products	327	476	8.8	27.7	63.5	24.4	4.2	r 71.5	21.6	0.0	60.6	17.9
Primary metals	331	532	6.0	10.9	r 83.0	16.4	D	82.9	19.4	D	67.5	12.8
Fabricated metal products	332	5,100	9.5	9.5	81.0	22.6	3.2	r 74.2	19.9	1.5	r 66.8	11.8
Machinery	333	3,190	14.1	8.2	77.7	34.0	1.9	r 64.1	27.8	3.4	r 63.2	5.6
Computer and electronic products	334	1,318	13.7	11.8	74.5	34.6	3.7	r 61.7	32.1	0.8	r 54.5	12.6
Communications equipment	3342	75	D	25.3	r 61.3	30.7	r D	46.7	30.7	r 0.0	53.3	r D
Semiconductor and other electronic components	3344	498	11.4	12.9	75.7	27.8	4.4	r 67.8	24.1	D	60.8	13.5
Navigational, measuring, electromedical, and control instruments	3345	589	17.3	r 11.5	71.2	44.1	D	54.2	41.9	D	49.6	8.1
Other computer and electronic products	other 334	156	8.3	r 1.9	89.8	22.6	r 0.0	77.4	20.8	r 0.0	54.5	24.7
Electrical equipment, appliances, and components	335	432	24.0	12.4	r 63.6	21.9	4.2	r 73.9	22.5	D	67.8	7.2
Transportation equipment	336	1,157	10.8	17.9	71.3	35.0	0.6	64.4	31.1	5.4	r 55.9	7.6
Automobiles, bodies, trailers, and parts	3361–63	940	8.8	19.9	71.3	34.6	0.4	r 65.0	30.6	D	56.9	6.2
Aerospace products and parts	3364	155	17.1	8.2	r 74.7	38.1	r D	60.6	36.3	0.0	51.6	12.1
Other transportation	other 336	62	D	11.3	r 59.7	r 34.9	r 0.0	65.1	D	D	48.4	r 21.0
Furniture and related products	337	881	8.4	19.6	r 72.0	27.9	7.4	r 64.7	32.5	D	48.7	12.6



TABLE 104

**Impact of robotics 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	1,492	14.1	r	8.4	77.5	26.9	1.5	r	71.6	24.6	D	53.3	21.4				
Medical equipment and supplies	3391	854	20.3	r	8.2	71.6	32.8	2.7	r	64.5	32.8	D	41.9	24.0				
Other miscellaneous manufacturing	3399	639	5.8		8.9	r	85.3	19.2	D	80.4	13.8	0.0	68.4	17.8	r			
Nonmanufacturing industries	11, 21–23, 42–81	67,883	9.4		6.5	84.1	22.2	2.2	75.6	19.1	1.5	52.9	26.5					
Agriculture, forestry, fishing, and hunting	11	259	0.0		35.4	r	64.6	D	0.0	99.6	D	0.0	62.5	37.5	r			
Mining, extraction, and support activities	21	233	3.0	r	2.6	r	94.4	7.7	0.0	92.3	6.4	0.0	67.4	26.2	r			
Utilities	22	36	0.0		D	88.9	19.4	r	D	72.2	r	13.9	r	D	61.1	r	13.9	r
Construction	23	7,354	10.8		7.7	81.5	23.9	2.3	73.8	21.5	1.9	r	52.5	24.1				
Wholesale trade	42	5,924	8.8		8.0	83.2	24.8	1.9	r	73.3	22.0	1.1	r	57.8	19.1			
Retail trade	44–45	10,449	8.6		10.6	80.8	21.8	5.1	73.1	13.7	2.9	53.8	29.6					
Transportation and warehousing	48–49	983	7.0	r	1.9	r	91.1	18.3	D	81.6	23.7	D	46.6	29.6				
Information	51	1,513	9.1		2.0	r	88.9	20.8	D	78.9	24.4	D	50.1	25.5				
Publishing	511	409	11.7	r	D	88.3	15.4	r	0.0	84.6	15.8	0.0	46.7	37.5				
Newspaper, periodical, book, and directory publishers	5111	97	D		D	92.8	16.7	r	0.0	83.3	20.0	r	0.0	42.1	r	37.9	r	
Software publishers	5112	312	13.5	r	0.0	86.5	15.4	r	0.0	84.6	14.4	r	0.0	48.3	37.4			
Telecommunications	517	110	D		D	90.9	36.1	r	0.0	63.9	36.0	r	0.0	38.7	25.2	r		
Data processing, hosting, and related services	518	316	20.3		D	73.7	26.6	D	73.1	31.0	D	56.6	12.0	r				
Other information	other 51	676	2.5	r	1.3	96.2	19.1	D	80.9	24.7	0.0	50.8	24.6					
Finance and insurance	52	1,529	3.8	r	3.9	r	92.3	13.5	D	84.0	13.6	0.0	52.9	33.5				
Real estate and rental and leasing	53	1,244	D		7.0	r	88.8	19.1	D	74.2	15.7	D	49.0	32.0				
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Other real estate and rental and leasing	other 53	1,244	D		7.0	r	88.8	19.1	D	74.2	15.7	D	49.0	32.0				
Professional, scientific, and technical services	54	15,401	10.4		3.1	86.5	24.6	1.0	74.4	24.8	0.8	55.7	18.7					
Legal services	5411	384	0.0		D	89.8	D	0.0	98.2	D	0.0	27.1	r	63.5				
Accounting, tax preparation, bookkeeping, and payroll services	5412	423	2.8		D	95.7	13.2	r	0.0	86.8	13.2	r	0.0	38.9	47.9			
Architectural, engineering, and related services	5413	7,090	12.1		3.4	84.5	29.3	1.7	69.0	27.4	1.5	r	63.3	7.8				
Specialized design services	5414	414	D		D	97.8	19.6	D	80.0	18.1	0.0	26.3	55.6					
Computer systems design and related services	5415	3,134	10.0		4.3	85.7	23.7	0.1	r	76.2	21.9	0.3	r	58.7	19.1			
Management, scientific, and technical consulting services	5416	2,057	10.3		D	89.3	18.9	D	81.0	24.6	D	48.4	26.9					
Scientific research and development services	5417	980	14.3		3.7	82.0	28.8	1.5	r	69.7	34.6	0.9	r	58.4	6.1			
Advertising, public relations, and related services	5418	323	D		D	98.8	1.9	0.0	98.1	4.3	r	0.0	41.2	54.5				
Other professional, scientific, and technical services	5419	596	8.9	r	D	90.1	23.8	0.0	76.2	25.4	0.0	30.3	44.2					

TABLE 104

**Impact of robotics 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	97	r	0.0	D	46.4	r	D	0.0	99.0	0.0	0.0	100.0	0.0	
Administrative and support and waste management and remediation services	56	2,630		20.1	7.6	r	72.3	22.4	3.5	r	74.1	12.2	D	50.1	37.4
Educational services	61	581		D	0.0	92.6	16.9	r	0.0	83.1	24.1	0.0	61.0	14.8	r
Health care and social assistance	62	11,349		7.7	2.0	90.3	20.9	D	78.4	18.0	D	55.5	25.7		
Health care services	621–23	11,050		7.9	2.0	90.1	21.4	D	77.8	18.5	D	55.8	24.9		
Social assistance	624	299		0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	44.8	55.2		
Arts, entertainment, and recreation	71	753		D	19.3	r	74.8	23.8	D	70.3	29.2	0.0	37.3	33.6	
Accommodation and food services	72	3,433		16.7	15.4	67.9	23.4	D	73.9	15.0	4.4	r	33.5	47.0	
Other services	81	4,110		4.6	r	7.7	r	87.7	18.9	D	79.0	13.3	D	48.8	35.8

D = withheld to avoid disclosing data for individual companies; data are included in higher level totals; r = relative standard error &gt; 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. Detail may exceed total because companies could select more than one response. 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.

TABLE 105

## Impact of robotics 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	88,422	8.1	6.6	63.3	22.0	5.7	2.5	73.3	18.5	4.9	2.4	75.1	17.6	5.5	2.8	73.8	17.9
Manufacturing industries	31–33	20,540	11.3	13.1	71.8	3.8	9.2	3.5	82.7	4.6	7.1	3.4	85.3	4.2	7.8	4.2	82.8	5.2
Food	311	1,051	11.0	r 28.7	56.6	3.6	r 14.0	1.1	81.0	3.9	r 9.9	3.3	r 82.9	3.9	r 7.1	r 6.9	r 77.8	8.1
Beverage and tobacco products	312	423	23.6	r 22.9	r 50.7	2.8	r 13.2	r 1.9	r 79.9	5.0	r 12.8	r 3.3	r 77.3	6.6	r 21.7	r 3.1	r 69.8	5.4
Textile, apparel, and leather products	313–16	378	9.8	r 21.2	r 67.5	D	9.0	r 17.8	r 73.2	0.0	5.3	r 15.3	r 79.3	0.0	8.7	r 3.7	r 75.1	12.4
Wood products	321	650	7.5	r 20.3	r 71.2	D	0.9	D	92.5	6.5	0.8	D	94.3	3.8	r 1.4	r 9.1	r 84.6	4.9
Paper	322	311	3.2	24.1	r 70.4	D	3.2	D	94.2	D	2.6	D	95.2	D	1.3	r 1.9	94.9	D
Printing and related support activities	323	680	7.5	r 10.0	81.1	1.5	r 9.3	r D	84.7	5.7	4.0	r 0.0	92.9	3.1	5.3	r 1.5	r 80.3	12.9
Petroleum and coal products	324	23	17.4	D	73.9	r 0.0	17.4	D	73.9	r 0.0	D	D	78.3	r 0.0	17.4	D	73.9	r 0.0
Chemicals	325	628	9.9	12.2	74.4	3.5	r 8.1	2.9	r 83.3	5.7	r 5.6	r D	88.1	5.6	r 9.4	2.9	r 82.0	5.7
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	40	0.0	12.8	87.2	0.0	0.0	0.0	65.0	r D	0.0	0.0	65.0	r D	0.0	D	57.5	r D
Pharmaceuticals and medicines	3254	143	5.6	r 11.2	r 81.8	D	7.0	r D	91.6	0.0	5.6	r D	93.7	0.0	7.0	r D	85.3	0.0
Soap, cleaning compound, and toilet preparation manufacturing	3256	158	4.4	8.9	r 81.6	D	7.6	r D	83.5	D	3.8	0.0	88.7	7.6	r D	D	88.6	7.6
Other chemicals	other 325	288	16.3	14.9	r 65.6	D	10.1	r D	82.3	D	8.0	r D	87.8	D	15.6	D	79.9	D
Plastics and rubber products	326	1,817	14.0	20.8	64.4	0.8	19.7	4.3	r 75.0	1.0	14.5	4.1	r 80.5	0.9	19.6	6.9	r 71.1	2.4
Nonmetallic mineral products	327	476	9.2	27.0	59.3	4.6	6.1	0.8	84.5	8.6	r 16.0	r 2.1	r 74.2	7.8	r 3.2	7.6	r 81.7	7.6
Primary metals	331	532	6.0	r 4.5	82.8	6.6	r 6.4	D	86.3	6.6	r 3.4	r D	88.0	8.1	r 4.9	D	87.8	6.6

TABLE 105

## Impact of robotics 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
Fabricated metal products	332	5,100	8.2	8.5	79.2	4.1 r	5.9	2.2 r	88.1	3.8	4.9	2.0 r	88.9	4.2	4.6	3.0 r	88.8	3.6
Machinery	333	3,190	13.8	9.7	72.6	3.9 r	12.9	2.0 r	80.3	4.8	10.9	3.5 r	82.5	3.1 r	8.6	3.1 r	83.5	4.8 r
Computer and electronic products	334	1,318	13.4	10.7	65.6	10.2	6.2 r	4.1 r	80.2	9.5	5.5	3.4 r	83.2	7.9	5.6	2.7 r	82.5	9.1
Communications equipment	3342	75	D	D	48.0	D	0.0	0.0	86.7	D	D	0.0	80.0	D	0.0	0.0	86.7	D
Semiconductor and other electronic components	3344	498	11.6	13.1	68.2	7.2 r	6.8 r	5.4 r	81.3	6.4 r	6.0 r	5.2 r	80.8	8.0 r	4.6	1.4 r	87.6	6.4 r
Navigational, measuring, electromedical, and control instruments	3345	589	16.5 r	8.5	67.7	7.3 r	6.8 r	4.6 r	80.0	8.5 r	5.8 r	3.6 r	84.1	6.5 r	7.3 r	4.4 r	80.2	8.0 r
Other computer and electronic products	other 334	156	7.1 r	7.1 r	56.7	29.0	D	D	74.4	21.2 r	5.1 r	0.0	86.5	D	3.8 r	3.2	72.9	20.0 r
Electrical equipment, appliances, and components	335	432	25.3	11.3 r	59.7	3.7	22.5	4.4 r	71.8	D	7.4	D	83.1	7.2 r	20.6	3.0 r	72.9	3.5 r
Transportation equipment	336	1,157	10.9	11.2	75.2	2.7	9.5	9.3 r	78.5	2.7	6.7 r	7.1 r	82.8	3.4 r	11.6 r	3.4	81.7	3.3
Automobiles, bodies, trailers, and parts	3361–63	940	8.7	12.0	77.6	1.7	8.0	10.4 r	79.4	2.2	6.1 r	7.7 r	84.1	2.1	10.6 r	2.8	83.9	2.7
Aerospace products and parts	3364	155	16.7	7.1 r	66.0	10.2 r	14.8	D	77.4	6.5 r	4.5 r	D	80.6	12.9 r	13.9	5.7 r	74.0	6.4 r
Other transportation	other 336	62	D	D	64.5 r	0.0	D	D	69.4 r	0.0	D	D	67.7 r	0.0	D	D	64.5 r	D
Furniture and related products	337	881	8.6	16.6	70.6	4.3 r	6.0	12.4 r	74.3	7.2	3.1 r	11.8 r	79.5	5.6	4.7	12.9 r	77.9	4.5
Miscellaneous	339	1,492	15.3	7.9	73.2	3.6	3.4	2.9 r	87.1	6.6	2.4 r	2.7 r	89.3	5.6	2.5	3.3	89.3	4.9
Medical equipment and supplies	3391	854	22.8	6.9	66.6	3.7	2.0	4.6 r	86.6	6.8	0.9	2.6 r	90.4	6.1	1.5	3.5 r	89.7	5.3
Other miscellaneous manufacturing	3399	639	5.3	9.4	82.0	3.3	5.2	0.9	87.5	6.4	4.5 r	2.7 r	87.8	4.9	3.8	2.8 r	89.1	4.2



TABLE 105

## Impact of robotics 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					
Other real estate and rental and leasing	other 53	1,244	D	D	57.0	32.0	D	7.0	r	72.3	17.4	D	D	71.3	21.9	D	D	75.7	17.4				
Professional, scientific, and technical services	54	15,401	7.9	1.8	59.9	30.4	4.1	0.8		70.6	24.5	3.5	0.6	73.2	22.7	4.3	0.8	72.4	22.5				
Legal services	5411	384	0.0	D	55.2	44.0	0.0	D		58.3	32.0	D	0.0	66.1	33.3	0.0	D	57.6	32.3				
Accounting, tax preparation, bookkeeping, and payroll services	5412	423	D	0.0	67.1	31.4	1.2	D		62.2	35.9	1.2	0.0	62.9	35.9	D	D	71.4	27.0				
Architectural, engineering, and related services	5413	7,090	10.2	2.3	61.7	25.8	2.8	0.3		74.8	22.1	3.1	0.4	80.4	16.1	2.2	0.5	81.0	16.3				
Specialized design services	5414	414	D	D	70.5	28.5	0.0	0.0		72.9	27.1	0.0	0.0	72.0	28.0	0.0	0.0	72.9	27.1				
Computer systems design and related services	5415	3,134	4.8	2.5	58.9	33.8	6.1	1.5	65.3	27.1	2.4	1.5	65.7	30.4	5.3	0.4	67.2	27.1					
Management, scientific, and technical consulting services	5416	2,057	10.2	0.5	52.4	36.9	7.8	D		65.5	26.6	7.2	D		62.9	29.6	11.2	0.5	56.7	31.6			
Scientific research and development services	5417	980	7.2	2.1		65.5	25.2	7.4	0.9	81.9	9.8	6.6	1.7		82.8	8.9	9.2	1.6		80.3	8.9		
Advertising, public relations, and related services	5418	323	D	D		36.2	62.2	D	0.0		45.8	53.3	D	0.0		45.5	54.2	D	D		44.6	54.2	
Other professional, scientific, and technical services	5419	596	8.9	0.0		62.3	28.8	D	D	71.1	27.9	D	D	75.7	21.0	1.5	D	65.1	32.7				
Management of companies and enterprises	55	97	0.0	D		46.4	r	0.0		0.0	0.0	100.0	0.0		0.0	0.0	100.0	0.0		0.0	0.0	100.0	0.0
Administrative and support and waste management and remediation services	56	2,630	16.5	3.7	48.9	31.0	3.7	D		60.3	36.0	3.5	D		62.7	33.8	5.6	D		61.7	32.6		

TABLE 105

**Impact of robotics 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
Educational services	61	581	D	0.0	53.4	46.3	D	0.0	92.4	D	D	0.0	77.6	22.2	D	0.0	92.4	D
Health care and social assistance	62	11,349	4.9	1.8	63.8	29.5	4.9	2.0	71.1	22.0	4.2	1.1 r	73.1	21.6	5.6	1.9	71.7	20.8
Health care services	621–23	11,050	5.0	1.9	64.1	29.0	5.0	2.0	71.6	21.4	4.3	1.1 r	73.2	21.4	5.7	1.9	71.4	21.0
Social assistance	624	299	0.0	0.0	49.5	50.5	0.0	0.0	58.5	41.5	0.0	0.0	72.2	D	0.0	0.0	86.0	D
Arts, entertainment, and recreation	71	753	D	D	43.3	43.0	D	D	49.0	37.6	0.0	D	49.4	43.0	D	D	49.0	37.6
Accommodation and food services	72	3,433	11.8	7.6	57.2	23.4	10.5	D	60.5	27.6	8.9	4.8 r	59.4	26.9	7.7	7.7	49.2	35.5
Other services	81	4,110	3.6 r	4.7 r	66.7	25.0	1.1 r	3.4 r	69.5	26.0	D	3.1 r	70.7	26.1	2.1 r	2.4 r	70.4	25.1

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

TABLE 106

**Motivation for specialized equipment technology adoption and utilization for companies using the technology, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To automate tasks performed by labor		To upgrade outdated processes or methods		To improve quality or reliability of processes or methods		To expand the range of goods or services		To adopt standards and accreditation		Some other reason	
All industries	11, 21–23, 31–33, 42–81	853,259	20.5		38.6		51.1		25.7		11.0		17.8	
Manufacturing industries	31–33	84,450	32.9		47.2		59.6		29.6		8.4		11.9	
Food	311	5,235	37.2		45.9		56.0		24.0		9.1		10.5	
Beverage and tobacco products	312	3,427	33.1		36.7		63.1		23.4		7.3		12.8	
Textile, apparel, and leather products	313–16	3,095	21.4		39.9		46.2		23.1		4.5		24.1	
Wood products	321	3,323	41.0		44.9		56.5		23.1		3.1		11.4	
Paper	322	745	42.8		53.3		56.2		25.2		5.8	r	10.3	r
Printing and related support activities	323	8,083	27.5		48.0		54.0		33.8		4.9		13.3	
Petroleum and coal products	324	251	12.0	r	52.2		39.4	r	36.7	r	13.9	r	3.2	r
Chemicals	325	2,945	35.0		42.9		64.1		28.5		12.6		10.8	
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	213	42.7		50.7		68.5		41.3	r	24.9	r	4.2	r
Pharmaceuticals and medicines	3254	632	37.3		44.5		69.0		30.1		26.6		10.3	
Soap, cleaning compound, and toilet preparation manufacturing	3256	586	43.3		44.2		59.4		25.3		6.8		13.8	
Other chemicals	other 325	1,514	29.7		40.6		63.3		27.3		7.5		11.0	
Plastics and rubber products	326	3,851	34.3		50.6		61.8		27.7		12.3		13.3	
Nonmetallic mineral products	327	2,310	26.4		50.0		54.6		23.8		9.6		11.0	
Primary metals	331	1,110	33.5		51.0		60.0		23.3		6.3		17.2	
Fabricated metal products	332	20,142	32.5		50.1		59.9		31.5		9.2		8.9	
Machinery	333	8,503	35.9		48.2		66.8		34.1		11.4		11.3	
Computer and electronic products	334	4,354	29.7		38.1		63.2		31.5		9.3		15.3	
Communications equipment	3342	488	26.0		33.2		69.5		27.7		8.0	r	8.4	
Semiconductor and other electronic components	3344	1,443	36.9		44.7		64.0		28.8		10.0		11.1	
Navigational, measuring, electromedical, and control instruments	3345	1,930	25.9		35.0		63.0		35.4		10.3		19.2	
Other computer and electronic products	other 334	494	26.9		35.2		55.3		28.1		4.3		18.4	
Electrical equipment, appliances, and components	335	1,814	31.0		40.8		65.0		29.3		5.8		15.5	
Transportation equipment	336	2,777	34.9		52.3		63.1		25.2		10.9		14.5	
Automobiles, bodies, trailers, and parts	3361–63	1,842	38.0		56.6		63.5		25.4		9.2		13.8	
Aerospace products and parts	3364	468	34.0		45.1		66.7		30.8		15.6		19.2	
Other transportation	other 336	466	23.2		42.7		58.2		18.9		12.9	r	12.4	
Furniture and related products	337	4,416	41.9		50.7		65.4		23.3		7.0		7.3	
Miscellaneous	339	8,067	31.1		47.7		56.3		35.0		7.4		13.3	
Medical equipment and supplies	3391	3,432	31.7		53.9		60.2		40.4		10.7		13.8	
Other miscellaneous manufacturing	3399	4,635	30.7		43.0		53.4		31.0		4.9		12.9	
Nonmanufacturing industries	11, 21–23, 42–81	768,809	19.1		37.6		50.2		25.3		11.2		18.4	
Agriculture, forestry, fishing, and hunting	11	4,266	23.4		41.0		51.2		15.6		6.0		18.6	
Mining, extraction, and support activities	21	2,511	18.8		37.6		51.1		15.5		2.2		16.8	
Utilities	22	684	18.6		35.2		52.3		13.3		10.4	r	26.0	
Construction	23	105,445	22.6		35.6		48.5		22.4		7.5		18.4	
Wholesale trade	42	38,117	24.1		39.7		47.5		25.0		8.6		18.4	



TABLE 106

**Motivation for specialized equipment technology adoption and utilization for companies using the technology, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To automate tasks performed by labor	To upgrade outdated processes or methods	To improve quality or reliability of processes or methods	To expand the range of goods or services	To adopt standards and accreditation	Some other reason
Retail trade	44–45	82,447	21.4	40.4	49.6	23.7	9.0	17.4
Transportation and warehousing	48–49	21,161	16.2	35.0	41.3	20.3	11.8	23.8
Information	51	13,835	15.9	40.7	50.6	27.7	10.6	18.6
Publishing	511	2,147	17.7	48.4	48.0	30.8	7.8	20.4
Newspaper, periodical, book, and directory publishers	5111	1,029	19.9	53.3	45.0	27.3	5.5 r	18.4
Software publishers	5112	1,119	15.7	44.0	50.8	34.0	9.7 r	22.3
Telecommunications	517	1,650	17.2	44.0	48.5	32.7	12.8	12.8
Data processing, hosting, and related services	518	1,673	24.4	45.7	56.1	35.6	12.0	19.4
Other information	other 51	8,364	13.5	37.1	50.6	24.3	10.7	19.1
Finance and insurance	52	12,468	21.7	46.8	54.4	21.1	13.8	17.2
Real estate and rental and leasing	53	16,228	20.3	40.1	45.3	21.4	10.4	18.2
Lessors of nonfinancial intangible assets (except copyrighted works)	533	127 r	D	D	D	D	D	D
Other real estate and rental and leasing	other 53	16,100	20.4	40.4	45.6	21.5	10.4	17.6
Professional, scientific, and technical services	54	105,874	20.4	39.5	54.2	29.2	11.4	17.8
Legal services	5411	8,791	27.3	44.3	55.2	11.3	7.6	20.1
Accounting, tax preparation, bookkeeping, and payroll services	5412	9,401	22.0	43.0	54.4	14.6	13.5	17.9
Architectural, engineering, and related services	5413	28,964	23.4	39.8	54.1	27.9	11.0	16.0
Specialized design services	5414	4,237	24.5	43.9	58.0	28.2	10.2	17.1
Computer systems design and related services	5415	14,332	21.1	38.2	49.6	40.6	12.9	20.9
Management, scientific, and technical consulting services	5416	12,934	18.4	34.9	52.0	27.9	10.7	22.1
Scientific research and development services	5417	3,892	25.0	31.6	64.1	28.1	13.8	20.6
Advertising, public relations, and related services	5418	3,993	18.7	42.7	52.6	32.9	5.1	13.9
Other professional, scientific, and technical services	5419	19,328	11.4	39.2	56.0	38.4	13.1	14.4
Management of companies and enterprises	55	394	37.3	52.0	89.3	27.4 r	D	0.0
Administrative and support and waste management and remediation services	56	46,344	25.5	36.7	48.8	27.3	8.7	18.3
Educational services	61	6,368	13.3	28.4	46.1	28.0	11.3	23.0
Health care and social assistance	62	162,430	12.8	36.2	52.8	26.7	17.9	18.7
Health care services	621–23	158,942	12.7	36.2	52.9	26.9	18.0	18.5
Social assistance	624	3,488	15.7	33.7	47.0	19.5	16.5	26.3
Arts, entertainment, and recreation	71	13,917	11.9	28.7	46.1	31.2	7.8	24.8
Accommodation and food services	72	50,999	22.7	39.3	47.9	20.6	8.3	18.1
Other services	81	85,324	17.3	36.6	49.4	26.5	10.0	17.7

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

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. Industry classification is based on dominant establishment payroll. Statistics are representative of companies located in the United States that reported a low, moderate, or high use of the technology (see [Table 92](#)).

**Source(s):**

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

TABLE 107

**Impact of specialized equipment 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	853,259	10.1	3.3	86.6	25.7	1.3	73.0	15.5	0.6	48.4	35.5
Manufacturing industries	31–33	84,450	13.7	5.8	80.5	28.9	1.7	69.4	19.7	0.8	55.6	23.9
Food	311	5,235	13.1	11.2	75.7	28.8	3.6	r 67.6	15.3	2.5	r 44.0	38.2
Beverage and tobacco products	312	3,427	17.7	5.1	77.2	29.1	0.4	70.5	17.0	D	54.1	28.8
Textile, apparel, and leather products	313–16	3,095	8.6	4.8	86.6	22.6	2.3	r 75.1	10.4	0.6	r 44.7	44.4
Wood products	321	3,323	12.4	8.5	79.1	17.7	5.4	76.9	12.2	1.8	r 56.7	29.3
Paper	322	745	35.5	3.6	r 60.9	42.1	0.0	57.9	28.6	0.0	46.6	24.8
Printing and related support activities	323	8,083	9.2	6.0	r 84.8	23.7	1.9	74.4	12.2	0.8	r 48.8	38.2
Petroleum and coal products	324	251	12.1	r 3.2	r 84.7	33.5	D	63.7	33.5	0.0	60.2	D
Chemicals	325	2,945	17.7	7.0	75.3	35.2	0.8	r 64.0	26.4	0.2	r 60.6	12.8
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	213	D	D	78.4	55.2	0.0	44.8	7.5	r 0.0	72.3	20.2
Pharmaceuticals and medicines	3254	632	19.5	4.6	r 75.9	32.2	1.1	66.7	28.1	0.5	r 62.4	9.0
Soap, cleaning compound, and toilet preparation manufacturing	3256	586	12.5	10.8	r 76.7	26.1	D	73.4	18.4	0.0	60.6	21.0
Other chemicals	other 325	1,514	18.5	7.6	73.9	37.2	0.9	r 61.9	31.4	D	58.1	10.2
Plastics and rubber products	326	3,851	15.2	5.4	79.4	25.4	0.9	73.7	17.1	0.5	64.5	17.9
Nonmetallic mineral products	327	2,310	15.3	6.4	78.3	29.1	2.6	68.3	14.4	0.5	55.6	29.5
Primary metals	331	1,110	17.1	r 6.4	r 76.5	18.5	D	81.1	15.4	0.0	59.3	25.3
Fabricated metal products	332	20,142	15.6	4.8	79.6	30.4	1.6	68.0	20.6	0.9	58.8	19.7
Machinery	333	8,503	13.6	3.5	82.9	35.5	0.2	r 64.3	28.8	0.2	r 60.8	10.2
Computer and electronic products	334	4,354	10.4	4.1	85.5	28.6	0.9	r 70.5	25.7	0.5	r 63.5	10.3
Communications equipment	3342	488	11.1	2.9	r 86.0	28.6	0.0	71.4	19.2	0.0	71.5	9.3
Semiconductor and other electronic components	3344	1,443	10.9	6.7	82.4	31.4	2.2	r 66.4	24.5	D	64.0	10.7
Navigational, measuring, electromedical, and control instruments	3345	1,930	10.9	3.2	85.9	28.0	0.3	71.7	30.6	D	59.0	10.2
Other computer and electronic products	other 334	494	6.3	1.2	r 92.5	22.9	D	76.5	16.8	D	72.1	10.3
Electrical equipment, appliances, and components	335	1,814	16.7	4.5	78.8	29.7	0.7	r 69.6	25.6	0.4	r 61.5	12.5
Transportation equipment	336	2,777	13.9	6.0	r 80.1	31.4	0.6	r 68.0	23.9	0.4	r 57.4	18.3
Automobiles, bodies, trailers, and parts	3361–63	1,842	10.7	7.6	r 81.7	27.8	0.4	r 71.8	23.4	0.3	r 57.0	19.3
Aerospace products and parts	3364	468	23.6	3.6	r 72.8	38.0	D	61.5	27.4	0.0	62.1	10.5
Other transportation	other 336	466	17.2	r 1.9	r 80.9	38.8	D	59.4	22.3	D	55.2	21.5
Furniture and related products	337	4,416	10.3	8.1	81.6	28.0	1.9	r 70.1	19.3	1.4	r 53.7	25.6
Miscellaneous	339	8,067	12.0	6.6	81.4	29.6	3.0	67.4	19.6	0.7	50.4	29.3

TABLE 107

**Impact of specialized equipment 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			
Medical equipment and supplies	3391	3,432	15.6	6.3	78.1	36.2	2.2	r	61.6	29.6	0.7	r	45.3	24.5	
Other miscellaneous manufacturing	3399	4,635	9.4	6.7	83.9	24.7	3.6		71.7	12.2	0.7	r	54.2	32.9	
Nonmanufacturing industries	11, 21–23, 42–81	768,809	9.7	3.0	87.3	25.4	1.3		73.3	15.1	0.6		47.6	36.8	
Agriculture, forestry, fishing, and hunting	11	4,266	6.7	7.3	86.0	24.1	D		73.2	13.3	D		43.0	42.3	
Mining, extraction, and support activities	21	2,511	4.3	3.5	r	92.2	19.2	0.3		80.5	14.8	D		64.8	20.2
Utilities	22	684	6.3	1.5		92.2	17.3	D		82.3	13.3	D		58.8	27.3
Construction	23	105,445	12.8	3.5		83.7	29.6	1.3		69.1	15.7	0.7		49.3	34.3
Wholesale trade	42	38,117	11.5	4.5		84.0	27.3	1.0		71.7	17.6	0.4	r	51.0	31.0
Retail trade	44–45	82,447	8.7	3.1		88.2	24.9	2.0		73.1	13.2	0.8		45.4	40.6
Transportation and warehousing	48–49	21,161	13.9	3.0		83.1	21.6	1.2		77.2	9.5	0.2	r	47.0	43.3
Information	51	13,835	7.4	2.8		89.8	24.9	0.7		74.4	16.8	0.5		50.2	32.5
Publishing	511	2,147	14.3	1.9		83.8	28.6	0.6	r	70.8	20.4	0.7		54.2	24.7
Newspaper, periodical, book, and directory publishers	5111	1,029	2.4	3.0		94.6	22.4	1.2	r	76.4	7.2	1.2	r	48.8	42.8
Software publishers	5112	1,119	25.1	0.9	r	74.0	34.2	0.0		65.8	32.6	D		58.8	8.1
Telecommunications	517	1,650	9.0	3.2		87.8	22.4	0.9	r	76.7	15.2	D		61.5	22.3
Data processing, hosting, and related services	518	1,673	11.8	3.0	r	85.2	30.4	D		68.8	24.9	0.0		53.3	21.8
Other information	other 51	8,364	4.5	2.9		92.6	23.4	0.6		76.0	14.5	0.5	r	46.4	38.6
Finance and insurance	52	12,468	10.2	2.0		87.8	26.7	0.7	r	72.6	18.2	D		48.2	32.9
Real estate and rental and leasing	53	16,228	5.8	1.9		92.3	17.8	0.9	r	81.3	10.4	0.9	r	44.6	44.1
Lessors of nonfinancial intangible assets (except copyrighted works)	533	127	r	0.0	D	55.9	r	0.0	D	55.9	r	0.0	D	D	D
Other real estate and rental and leasing	other 53	16,100	5.8	1.6		92.6	17.9	D		81.5	10.5	D		44.9	44.0
Professional, scientific, and technical services	54	105,874	9.7	2.0		88.3	27.3	0.5		72.2	22.0	0.3		53.9	23.8
Legal services	5411	8,791	6.7	1.8	r	91.5	22.5	1.2	r	76.3	15.7	D		39.2	45.1
Accounting, tax preparation, bookkeeping, and payroll services	5412	9,401	9.8	0.9		89.3	22.5	D		77.4	14.7	D		51.0	34.1
Architectural, engineering, and related services	5413	28,964	9.3	2.0		88.7	27.7	0.5		71.8	25.8	0.3		61.9	12.0
Specialized design services	5414	4,237	7.9	2.4	r	89.7	24.7	D		75.2	14.5	0.0		43.0	42.5
Computer systems design and related services	5415	14,332	12.3	2.4		85.3	28.7	0.6		70.7	27.9	0.2	r	56.4	15.5
Management, scientific, and technical consulting services	5416	12,934	10.8	1.3	r	87.9	29.5	0.6	r	69.9	25.2	0.4	r	50.5	23.9
Scientific research and development services	5417	3,892	14.7	1.7		83.6	30.4	0.4	r	69.2	32.6	0.4	r	60.6	6.4
Advertising, public relations, and related services	5418	3,993	13.8	5.9		80.3	24.9	0.3		74.8	13.3	D		48.2	38.4
Other professional, scientific, and technical services	5419	19,328	7.4	1.9		90.7	29.0	D		70.8	17.4	0.8	r	52.2	29.6
Management of companies and enterprises	55	394	D	D		73.1	14.0	r	0.0	86.0	D	0.0		85.3	D

TABLE 107

**Impact of specialized equipment 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		
Administrative and support and waste management and remediation services	56	46,344	14.0	4.0	82.0	27.4	1.9	70.7	12.1	0.4	r	40.0	47.5	
Educational services	61	6,368	8.4	2.0	r	89.6	17.5	2.7	r	79.8	7.3	0.0	43.8	48.9
Health care and social assistance	62	162,430	7.2	1.6		91.2	22.8	0.7		76.5	15.3	0.3	50.2	34.2
Health care services	621–23	158,942	7.1	1.6		91.3	22.7	0.7		76.6	15.4	0.3	50.3	34.0
Social assistance	624	3,488	11.8	D		86.6	28.6	D		70.2	13.0	0.0	40.8	46.1
Arts, entertainment, and recreation	71	13,917	7.3	3.2		89.5	24.1	D		75.2	10.8	D	35.3	53.2
Accommodation and food services	72	50,999	11.7	5.9		82.4	19.0	3.2		77.8	8.5	2.1	40.1	49.3
Other services	81	85,324	7.8	3.7		88.5	28.4	1.6		70.0	14.2	0.5	43.8	41.4

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

TABLE 108

## Impact of specialized equipment 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	853,259	7.6	2.3	60.9	29.2	4.3	1.6	71.3	22.8	4.5	1.2	72.3	22.0	5.1	1.4	71.9	21.6	
Manufacturing industries	31–33	84,450	13.0	5.3	73.5	8.2	7.0	2.1	81.6	9.3	5.5	1.5	82.8	10.2	6.9	2.2	79.3	11.6	
Food	311	5,235	15.0	10.8	65.4	8.8	7.4	2.9	79.1	10.6	8.3	2.0	78.4	11.3	6.7	3.8	76.7	12.8	
Beverage and tobacco products	312	3,427	15.9	4.9	72.0	7.2	11.4	1.9	r 76.0	10.7	8.3	0.6	78.4	12.7	10.9	1.1	76.5	11.5	
Textile, apparel, and leather products	313–16	3,095	8.0	5.1	73.3	13.6	4.4	2.7	r 75.3	17.6	2.1	1.1	74.3	22.5	5.7	1.3	73.8	19.3	
Wood products	321	3,323	11.6	5.7	74.9	7.8	6.2	1.3	83.4	9.1	3.2	2.5	r 85.3	9.0	4.0	2.0	79.6	14.4	
Paper	322	745	34.5	5.0	r 56.9	3.6	r 22.0	r D	73.3	4.0	r 6.7	6.0	r 82.7	4.6	r 16.4	r 1.5	71.8	10.3	r
Printing and related support activities	323	8,083	10.0	5.2	75.5	9.3	5.2	1.6	81.0	12.2	3.7	1.0	80.7	14.6	5.9	1.5	76.9	15.7	
Petroleum and coal products	324	251	12.0	r D	79.7	7.6	r 3.6	r D	90.0	D	1.6	0.0	92.8	D	2.0	D	89.2	8.4	r
Chemicals	325	2,945	14.9	6.4	75.7	3.0	12.3	0.8	82.3	4.6	8.5	0.6	r 87.6	3.3	10.6	1.6	82.6	5.2	
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	213	22.0	r D	67.8	10.2	r D	0.0	86.9	11.7	r D	0.0	67.1	10.8	r 0.0	0.0	87.0	13.0	r
Pharmaceuticals and medicines	3254	632	14.1	3.0	80.2	2.7	13.3	D	83.7	2.5	r 5.2	0.8	91.9	2.1	r 10.1	0.8	r 86.9	2.2	
Soap, cleaning compound, and toilet preparation manufacturing	3256	586	9.9	10.8	74.7	4.6	8.7	D	82.1	8.2	7.0	D	86.2	6.7	r 7.5	2.7	r 80.8	9.0	
Other chemicals	other 325	1,514	16.2	6.9	75.2	1.7	r 14.8	0.9	r 81.2	3.2	r 8.7	r 0.9	r 89.1	1.3	r 13.3	1.7	81.0	4.0	r
Plastics and rubber products	326	3,851	13.0	5.0	79.0	3.0	11.8	1.9	81.7	4.6	9.8	1.7	83.9	4.6	10.9	1.9	80.8	6.4	
Nonmetallic mineral products	327	2,310	15.5	6.1	71.0	7.4	8.1	1.7	r 77.6	12.6	5.9	1.0	r 82.3	10.8	10.5	3.2	70.5	15.8	
Primary metals	331	1,110	9.0	8.4	r 71.2	11.4	4.3	1.1	82.7	11.9	r 3.8	0.7	r 83.9	11.6	3.6	1.3	81.6	13.5	

TABLE 108

## Impact of specialized equipment 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						
Fabricated metal products	332	20,142	15.0	3.9	73.4	7.7	6.0	2.3	83.8	7.9	5.8	1.2	85.0	8.0	7.1	2.4	81.1	9.4						
Machinery	333	8,503	12.4	4.1	72.9	10.6	8.7	1.8	81.8	7.7	5.8	1.4	82.5	10.3	6.6	1.6	79.2	12.6						
Computer and electronic products	334	4,354	9.6	4.0	76.5	9.9	5.9	2.0	85.4	6.7	4.9	2.2	84.4	8.5	4.8	2.1	85.1	8.0						
Communications equipment	3342	488	11.1	1.6	78.1	9.2	5.1	D	88.3	5.5	r	2.5	D	90.0	6.8	r	5.7	1.2	87.6	5.5	r			
Semiconductor and other electronic components	3344	1,443	10.5	6.7	76.1	6.7	7.1	2.9	r	84.0	6.0	6.5	3.5	r	85.1	4.9	3.7	2.7	r	86.7	6.9			
Navigational, measuring, electromedical, and control instruments	3345	1,930	9.7	3.4	76.1	10.8	6.0	2.2	85.4	6.4	5.0	2.0	r	82.2	10.8	5.9	2.3	83.9	7.9					
Other computer and electronic products	other 334	494	5.9	1.2	r	76.0	16.9	2.8	0.0	86.9	10.3	2.0	D	84.6	12.1	2.0	1.0	82.6	14.4					
Electrical equipment, appliances, and components	335	1,814	18.9	4.2	67.0	9.9	8.3	1.4	r	83.9	6.4	5.8	1.7	r	85.8	6.7	10.1	1.7	80.3	7.9				
Transportation equipment	336	2,777	14.0	6.8	73.1	6.1	6.8	4.2	r	81.6	7.4	7.7	3.1	r	82.0	7.2	8.4	3.2	r	80.2	8.2			
Automobiles, bodies, trailers, and parts	3361–63	1,842	9.3	8.5	r	76.3	5.9	r	4.2	5.8	r	82.7	7.3	4.8	4.1	r	84.0	7.1	4.9	4.2	r	83.4	7.5	
Aerospace products and parts	3364	468	26.6	5.8	63.5	4.1	r	11.5	D	82.5	5.3	10.9	0.6	83.3	5.3	13.7	2.1	r	77.8	6.4	r			
Other transportation	other 336	466	19.3	r	1.1	r	70.9	8.8	12.2	r	1.9	r	75.7	10.1	16.3	r	D	71.5	10.5	17.0	r	D	70.0	12.7
Furniture and related products	337	4,416	9.8	6.4	79.0	4.8	5.3	2.3	r	83.2	9.2	2.7	1.4	r	85.8	10.1	4.4	3.3	82.3	10.0				
Miscellaneous	339	8,067	10.9	5.7	73.6	9.8	4.2	2.4	80.1	13.3	3.9	1.5	81.4	13.2	4.3	2.2	77.8	15.7						
Medical equipment and supplies	3391	3,432	15.2	5.9	69.4	9.5	3.6	1.6	80.1	14.7	5.5	1.1	r	80.8	12.6	4.4	2.6	74.5	18.5					
Other miscellaneous manufacturing	3399	4,635	7.7	5.6	76.7	10.0	4.6	3.0	80.2	12.2	2.7	1.8	r	81.8	13.7	4.3	1.9	r	80.1	13.7				

TABLE 108

## Impact of specialized equipment 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
Nonmanufacturing industries	11, 21–23, 42–81	768,809	7.0	2.0	59.5	31.5	4.1	1.6	70.0	24.3	4.4	1.1	71.2	23.3	4.9	1.3	71.1	22.7
Agriculture, forestry, fishing, and hunting	11	4,266	3.0	r 4.0	70.2	22.8	4.6	3.6	r 59.0	32.8	D	D	71.2	26.6	D	D	71.5	24.3
Mining, extraction, and support activities	21	2,511	2.3	r 2.7	74.3	20.7	1.4	2.5	r 79.1	17.0	1.2	2.5	r 81.6	14.7	1.5	0.4	85.3	12.8
Utilities	22	684	3.8	0.7	68.1	27.4	2.0	D	72.5	24.6	3.7	0.7	80.2	15.4	2.8	1.3	78.0	17.9
Construction	23	105,445	11.2	2.2	62.1	24.5	4.0	1.7	71.2	23.1	6.5	1.4	72.3	19.8	6.4	1.2	73.3	19.1
Wholesale trade	42	38,117	8.6	3.9	65.4	22.1	6.6	2.1	76.8	14.5	5.9	1.4	78.5	14.2	7.0	1.6	76.7	14.7
Retail trade	44–45	82,447	6.3	2.0	63.0	28.7	3.8	1.6	73.8	20.8	3.8	1.4	74.8	20.0	4.4	1.5	74.6	19.5
Transportation and warehousing	48–49	21,161	6.9	2.2	53.3	37.6	5.4	1.5	65.6	27.5	5.4	0.3	r 68.5	25.8	5.9	2.0	67.3	24.8
Information	51	13,835	5.1	1.7	59.7	33.5	3.7	1.2	68.6	26.5	4.2	0.7	69.5	25.6	4.6	1.1	67.9	26.4
Publishing	511	2,147	7.2	1.4	68.3	23.1	9.3	1.7	73.3	15.7	10.1	1.2	72.2	16.5	9.9	2.3	67.8	20.0
Newspaper, periodical, book, and directory publishers	5111	1,029	2.2	2.8	77.6	17.4	0.8	r 1.9	78.1	19.2	1.1	1.6	r 73.2	24.2	0.8	r 3.8	64.3	31.1
Software publishers	5112	1,119	11.8	0.0	59.9	28.3	17.2	1.3	68.9	12.6	18.5	0.9	r 71.2	9.4	18.2	1.1	r 71.0	9.7
Telecommunications	517	1,650	6.3	2.3	r 62.0	29.4	2.7	3.9	r 76.0	17.4	2.9	2.7	r 77.8	16.6	4.2	3.0	r 75.5	17.3
Data processing, hosting, and related services	518	1,673	10.5	0.9	60.6	28.0	9.7	0.4	66.1	23.8	8.1	D	75.6	16.0	10.3	1.6	r 68.7	19.4
Other information	other 51	8,364	3.3	1.9	56.7	38.1	1.2	0.7	66.6	31.5	2.1	0.2	r 66.0	31.7	2.1	0.4	66.3	31.2
Finance and insurance	52	12,468	7.1	1.1	r 59.0	32.8	6.1	1.7	69.2	23.0	5.6	0.8	r 70.0	23.6	7.1	1.1	66.9	24.9
Real estate and rental and leasing	53	16,228	4.9	1.4	r 52.9	40.8	4.0	1.5	61.1	33.4	4.0	1.3	63.1	31.6	5.0	0.6	r 61.5	32.9
Lessors of nonfinancial intangible assets (except copyrighted works)	533	127	r 0.0	0.0	D	54.3	r 0.0	0.0	45.7	r D	0.0	0.0	90.6	D	0.0	0.0	90.6	D



TABLE 108

## Impact of specialized equipment 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
Other real estate and rental and leasing	other 53	16,100	4.9	1.4	r 53.0	40.7	4.0	1.5	61.3	33.2	4.0	1.3	62.9	31.8	5.1	0.6	r 61.2	33.1
Professional, scientific, and technical services	54	105,874	6.3	1.3	57.4	35.0	4.7	1.2	69.6	24.5	4.4	0.6	69.6	25.4	5.1	1.2	69.0	24.7
Legal services	5411	8,791	3.9	0.7	r 45.7	49.7	3.2	1.4	r 58.0	37.4	4.5	0.7	r 58.3	36.5	4.6	1.9	r 59.8	33.7
Accounting, tax preparation, bookkeeping, and payroll services	5412	9,401	6.3	1.3	45.5	46.9	4.6	1.5	61.2	32.7	0.8	r 0.9	r 64.6	33.7	3.0	D	64.7	31.5
Architectural, engineering, and related services	5413	28,964	5.8	1.6	64.7	27.9	3.6	1.6	75.3	19.5	3.8	0.3	76.8	19.1	4.5	0.9	75.5	19.1
Specialized design services	5414	4,237	3.4	r 1.4	r 56.4	38.8	3.8	D	62.2	33.9	3.7	D	59.5	36.7	4.0	D	57.4	38.6
Computer systems design and related services	5415	14,332	7.3	1.1	r 60.5	31.1	6.1	0.7	71.7	21.5	5.0	1.0	72.4	21.6	6.0	1.4	71.3	21.3
Management, scientific, and technical consulting services	5416	12,934	9.5	1.2	r 51.6	37.7	7.9	1.0	r 67.5	23.6	7.5	1.2	r 63.9	27.4	8.2	1.6	62.5	27.7
Scientific research and development services	5417	3,892	8.7	1.3	60.7	29.3	6.9	1.3	79.1	12.7	6.4	0.9	80.3	12.4	8.1	1.2	77.4	13.3
Advertising, public relations, and related services	5418	3,993	8.9	3.7	61.2	26.2	5.7	3.0	r 67.2	24.1	2.9	2.0	r 68.4	26.7	5.4	2.6	r 66.6	25.4
Other professional, scientific, and technical services	5419	19,328	4.7	0.7	58.3	36.3	3.4	0.7	70.7	25.2	4.2	D	68.8	26.9	4.0	0.9	70.0	25.1
Management of companies and enterprises	55	394	0.0	D	77.9	D	D	0.0	64.7	D	0.0	D	78.2	D	D	0.0	78.2	D
Administrative and support and waste management and remediation services	56	46,344	11.6	2.5	56.6	29.3	5.5	2.4	65.9	26.2	6.6	1.6	68.2	23.6	6.4	2.3	66.0	25.3

**TABLE 108**  
**Impact of specialized equipment 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			
Educational services	61	6,368	4.1	1.4	r	44.6	50.0	3.9	D	66.4	29.0	4.6	D	64.6	30.2	5.3	D	64.4	28.8		
Health care and social assistance	62	162,430	4.4	0.7		56.2	38.7	3.3	0.9	71.0	24.8	3.0	0.6	71.7	24.7	3.7	0.7	73.0	22.6		
Health care services	621–23	158,942	4.4	0.7		56.4	38.5	3.3	0.9	71.1	24.7	3.0	0.6	71.7	24.7	3.6	0.7	73.2	22.5		
Social assistance	624	3,488	7.1	D		43.2	48.1	3.6	D	62.5	32.7	4.8	r	0.0	70.6	24.6	7.1	D	66.7	24.6	
Arts, entertainment, and recreation	71	13,917	2.3	2.3		47.6	47.8	1.7	r	2.2	60.2	35.9	3.7	2.0	r	57.8	36.5	4.1	1.7	61.0	33.2
Accommodation and food services	72	50,999	8.8	5.5		63.2	22.5	4.5	3.4	70.4	21.7	4.9	3.4	74.0	17.7	5.4	3.2	71.5	19.9		
Other services	81	85,324	6.4	2.1		62.5	29.0	2.5	1.5	68.7	27.3	2.7	0.7	68.6	28.0	3.6	1.2	68.4	26.8		

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.

TABLE 109

## Factors adversely affecting technology adoption and utilization, by industry—artificial intelligence: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
All industries	11, 21–23, 31–33, 42–81	4,805,151	7.5	2.0	0.9	0.5	1.1	0.8	1.1	1.4	45.9	42.4
Manufacturing industries	31–33	217,565	12.5	2.4	1.0	0.6	2.4	0.5	1.0	2.8	43.5	39.6
Food	311	18,250	12.7	1.0	0.6	0.5	1.5	0.3	0.9	3.0	45.4	37.5
Beverage and tobacco products	312	7,723	12.1	1.6	1.3 r	0.5	1.9	0.8 r	0.6	3.1	41.1	43.1
Textile, apparel, and leather products	313–16	10,554	12.4	0.9	0.5	0.2	1.8	0.2 r	0.7 r	1.8	42.1	40.9
Wood products	321	11,012	9.7	0.7	0.8	0.2	0.9	0.5 r	0.2	1.5	43.3	42.3
Paper	322	2,117	14.4	8.1 r	0.3 r	3.2 r	1.7	0.0	2.7 r	5.6 r	55.9	28.6
Printing and related support activities	323	20,851	10.7	1.9	0.5	0.5 r	1.6	0.2	0.5	1.5	44.5	42.0
Petroleum and coal products	324	583	9.9 r	0.9	D	D	3.4 r	6.3 r	3.8 r	D	34.1	55.1
Chemicals	325	7,522	13.3	3.8	1.9	0.7	3.3	0.7	1.4	4.5	41.7	39.3
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	6.4 r	1.9 r	0.0	0.0	0.0	0.0	0.0	D	49.6	40.8
Pharmaceuticals and medicines	3254	1,365	12.9	5.4	2.0	0.4 r	2.3 r	1.0 r	1.7	5.8	44.7	37.2
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	15.5	1.0	1.0 r	0.5 r	5.9	0.4 r	1.5	7.5	37.1	43.0
Other chemicals	other 325	3,927	13.5	4.8 r	2.5 r	1.0 r	3.0	0.8 r	1.5 r	3.4	41.5	38.3
Plastics and rubber products	326	8,087	17.2	3.1	1.3	0.1	4.8	0.6 r	1.2 r	4.2	44.4	34.6
Nonmetallic mineral products	327	7,749	9.9	1.9	1.0 r	0.9 r	2.0	0.9 r	1.0 r	1.7 r	49.2	39.8
Primary metals	331	2,537	14.4	2.0	1.8 r	0.6	2.2	0.4 r	0.3	1.8	45.3	34.7
Fabricated metal products	332	48,472	14.2	2.5	0.9	0.2	2.3	0.4	1.0	3.1	42.8	39.7
Machinery	333	18,558	12.7	3.2	1.1	0.8	3.3	0.3	1.8	2.7	42.5	38.3
Computer and electronic products	334	9,036	9.0	4.6	2.4	1.4	4.7	1.9	2.4	4.9	44.3	39.3
Communications equipment	3342	974	8.6	5.0	2.0 r	D	2.6 r	D	3.1 r	4.5	45.8	38.2
Semiconductor and other electronic components	3344	2,796	9.2	5.3	1.8	1.6	3.8	1.0 r	1.3 r	4.1	46.5	36.6
Navigational, measuring, electromedical, and control instruments	3345	3,909	9.7	4.9	3.1	1.0 r	6.5	3.0	3.0	6.4	42.0	40.7
Other computer and electronic products	other 334	1,359	7.2	2.4	2.1 r	1.4 r	2.8 r	0.8 r	2.1 r	2.4	45.1	41.8
Electrical equipment, appliances, and components	335	4,000	12.6	4.4	3.3	1.1	3.6	0.8	1.4	1.8	43.9	38.3
Transportation equipment	336	7,175	13.2	3.2	1.9	1.1 r	3.7	0.4	2.1 r	2.5	40.6	39.6
Automobiles, bodies, trailers, and parts	3361–63	4,565	14.0	3.2	2.3	1.6 r	4.4	0.3	2.6 r	3.0	38.3	40.4

TABLE 109

## Factors adversely affecting technology adoption and utilization, by industry—artificial intelligence: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Aerospace products and parts	3364	985	13.9	5.6	2.0 r	0.8 r	2.7	D	2.3 r	3.0	42.5	38.3
Other transportation	other 336	1,625	10.7	1.5 r	0.7	D	2.5	0.7 r	0.6	0.8	45.8	38.0
Furniture and related products	337	12,647	12.0	1.5	0.9	0.5	2.6	0.3 r	0.5	2.8	42.0	40.7
Miscellaneous	339	20,669	12.2	2.8	0.9	0.8	2.2	0.8	0.9	2.6	43.1	39.6
Medical equipment and supplies	3391	8,060	15.0	3.9	0.7	0.9	2.4	1.3	1.6 r	3.2	40.1	38.9
Other miscellaneous manufacturing	3399	12,608	10.3	2.1	1.0	0.7 r	2.1	0.5	0.5	2.2	45.1	40.0
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	7.3	2.0	0.8	0.5	1.1	0.8	1.1	1.4	46.0	42.6
Agriculture, forestry, fishing, and hunting	11	21,606	5.2	0.5 r	D	D	0.9	0.8 r	D	0.7	52.3	40.0
Mining, extraction, and support activities	21	14,969	6.0	2.1	1.4	1.0 r	1.7	0.6	0.9 r	1.4 r	47.3	41.0
Utilities	22	2,684	5.9	2.0	1.5 r	0.7	1.6	1.7 r	1.2	1.5	46.9	41.1
Construction	23	613,110	5.9	0.6	0.5	0.2	0.7	0.4	0.7	0.9	50.0	41.3
Wholesale trade	42	257,153	8.3	1.7	1.0	0.6	1.5	0.5	0.7	1.4	45.4	42.1
Retail trade	44–45	560,952	9.2	1.1	0.8	0.4	1.1	0.6	0.8	1.4	46.3	41.7
Transportation and warehousing	48–49	152,463	8.0	1.7	0.6	0.5	0.7	1.6	1.0	1.5	43.6	42.8
Information	51	61,638	6.3	5.4	1.7	1.1	2.8	0.5	1.1	3.1	40.7	44.3
Publishing	511	17,590	6.5	5.5	2.7	1.1	2.8	0.6	0.9	4.1	40.1	44.1
Newspaper, periodical, book, and directory publishers	5111	9,761	7.2	1.7	1.1 r	0.3	1.2	0.3 r	1.1	2.7	45.1	43.1
Software publishers	5112	7,828	5.8	10.3	4.8	2.1	4.8	0.9	0.6	5.7	33.9	45.2
Telecommunications	517	7,164	8.9	3.3	1.8	1.2	1.4	0.8	0.7	2.4	39.9	45.1
Data processing, hosting, and related services	518	8,918	7.3	8.0	2.7	1.7	5.5	0.8	2.1	5.2	32.1	47.2
Other information	other 51	27,965	5.1	4.9	0.8	1.0	2.3	0.3	1.0	2.1	44.0	43.3
Finance and insurance	52	200,857	5.9	3.1	1.2	0.7	1.1	2.1	2.2	1.1	38.3	48.4
Real estate and rental and leasing	53	255,783	4.8	1.9	0.9	0.6	0.8	0.4	0.9	0.9	45.1	45.8
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	8.6	D	11.7	D	D	0.0	D	10.9	36.1	46.5
Other real estate and rental and leasing	other 53	253,970	4.8	1.8	0.8	0.7	0.8	0.4	0.9	0.8	45.2	45.8
Professional, scientific, and technical services	54	695,672	6.4	4.1	1.1	0.7	1.7	1.0	1.6	1.8	43.7	43.6
Legal services	5411	152,243	5.7	3.6	0.7	0.6	1.1	1.3	1.5	1.0	47.1	41.9

TABLE 109

**Factors adversely affecting technology adoption and utilization, by industry—artificial intelligence: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	7.5	4.1	0.7	0.8	1.3	1.6	3.4	1.2	39.2	45.4
Architectural, engineering, and related services	5413	88,491	6.5	3.4	1.2	0.6	1.4	0.6	1.0	1.6	50.5	39.4
Specialized design services	5414	26,282	5.7	1.4	0.5	D	1.1	D	0.9	1.6	53.2	38.0
Computer systems design and related services	5415	95,950	7.3	8.0	2.6	1.3	3.9	0.9	2.0	4.0	34.4	47.2
Management, scientific, and technical consulting services	5416	132,989	5.8	3.6	1.0	0.6	1.8	0.6	1.0	1.9	42.5	46.0
Scientific research and development services	5417	9,798	5.8	6.4	2.2	1.6	3.1	0.8	1.4	4.6	43.9	38.8
Advertising, public relations, and related services	5418	27,677	5.6	3.2	0.9	0.7	1.2	0.5 r	0.8	2.3	43.6	45.5
Other professional, scientific, and technical services	5419	55,569	6.7	2.8	0.6	0.4 r	0.7	1.0	1.0	1.2	46.2	42.2
Management of companies and enterprises	55	2,409	3.4 r	0.3	1.6 r	D	D	D	D	0.0	38.9	55.6
Administrative and support and waste management and remediation services	56	287,807	7.6	1.7	0.7	0.5	1.1	0.5	0.9	1.4	46.6	42.0
Educational services	61	53,912	5.6	1.9	0.3 r	0.3 r	0.7	0.6	0.6	1.7	47.5	43.6
Health care and social assistance	62	519,556	7.5	3.0	0.8	0.4	0.9	1.3	1.7	1.5	46.8	41.1
Health care services	621–23	459,855	7.5	3.2	0.8	0.5	0.9	1.4	1.8	1.5	46.6	41.3
Social assistance	624	59,700	7.3	1.6	0.8	0.1 r	0.9	1.0	1.0	1.4	48.2	39.9
Arts, entertainment, and recreation	71	88,831	4.7	1.1	0.8	0.2	0.8	0.2 r	0.5	0.9	47.1	46.1
Accommodation and food services	72	453,059	9.7	1.4	0.9	0.5	0.9	0.5	0.8	1.2	45.8	41.6
Other services	81	345,125	7.7	0.8	0.8	0.5	0.7	0.5	0.7	1.4	48.0	41.1

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

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. 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.

TABLE 110

## Factors adversely affecting technology adoption and utilization, by industry—cloud-based computing systems and applications: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
All industries	11, 21–23, 31–33, 42–81	4,805,151	6.9	1.1	0.8	0.5	1.0	1.0	4.1	1.3	30.4	54.3
Manufacturing industries	31–33	217,565	9.1	1.1	0.9	0.7	1.9	0.6	5.4	2.1	30.2	50.1
Food	311	18,250	9.5	0.6	0.8	0.7	1.4	0.2	3.7	1.9	34.0	47.0
Beverage and tobacco products	312	7,723	9.3	1.4	1.1	0.5	2.0	0.6	3.5	3.2	21.2	60.2
Textile, apparel, and leather products	313–16	10,554	10.1	1.4	0.6	1.3	2.2	0.3	3.2	1.6	30.3	49.5
Wood products	321	11,012	6.5	0.7	0.5	0.4	1.6	0.7	4.1	1.3	35.1	47.2
Paper	322	2,117	7.8	2.3	0.1	1.0	1.0	0.0	4.2	5.1	40.2	42.7
Printing and related support activities	323	20,851	10.0	0.9	0.5	0.4	0.9	0.2	3.5	1.7	26.0	55.6
Petroleum and coal products	324	583	3.3	D	D	0.0	3.6	D	2.2	D	21.4	66.7
Chemicals	325	7,522	9.0	0.9	1.3	0.7	2.3	0.7	6.4	2.3	27.9	52.1
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	6.1	0.0	D	D	D	0.0	12.8	0.0	34.2	46.2
Pharmaceuticals and medicines	3254	1,365	8.9	1.5	1.2	1.1	2.1	1.2	7.2	3.4	26.8	50.7
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	10.5	0.4	1.4	1.5	6.1	0.4	3.7	5.7	21.3	58.1
Other chemicals	other 325	3,927	8.9	0.9	1.5	0.3	1.1	0.7	6.3	0.9	30.1	51.0
Plastics and rubber products	326	8,087	9.0	2.7	1.2	0.7	2.1	1.1	10.1	2.4	28.3	46.2
Nonmetallic mineral products	327	7,749	7.0	1.1	1.0	0.8	1.7	1.2	4.3	1.5	35.5	49.4
Primary metals	331	2,537	18.1	0.6	1.5	0.6	3.7	0.5	5.8	3.6	27.5	44.0
Fabricated metal products	332	48,472	9.3	0.8	0.6	0.7	1.4	0.5	6.4	1.8	32.5	48.1
Machinery	333	18,558	8.1	1.9	0.6	1.0	3.2	0.5	7.6	2.0	29.4	50.3
Computer and electronic products	334	9,036	9.5	2.0	1.6	1.1	4.0	1.7	9.6	4.3	24.1	50.4
Communications equipment	3342	974	5.6	0.3	D	2.2	2.7	2.9	13.8	4.8	21.8	52.8
Semiconductor and other electronic components	3344	2,796	8.1	2.3	1.6	0.7	3.9	2.0	10.4	5.5	25.6	45.8
Navigational, measuring, electromedical, and control instruments	3345	3,909	10.1	1.8	1.9	1.2	5.0	1.7	9.0	4.3	23.5	51.7
Other computer and electronic products	other 334	1,359	13.0	3.2	1.8	1.0	2.5	D	6.9	1.9	24.7	54.3
Electrical equipment, appliances, and components	335	4,000	8.3	1.0	1.2	0.4	1.2	0.9	7.6	1.8	28.1	52.0
Transportation equipment	336	7,175	10.5	1.0	2.0	1.1	3.7	0.8	7.6	2.7	29.5	47.2
Automobiles, bodies, trailers, and parts	3361–63	4,565	11.2	1.2	2.6	1.1	4.7	0.4	8.3	3.3	28.8	46.9

TABLE 110

## Factors adversely affecting technology adoption and utilization, by industry—cloud-based computing systems and applications: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Aerospace products and parts	3364	985	9.3	1.5	1.5	1.5	2.2	2.5	10.2	3.6	23.6	51.6
Other transportation	other 336	1,625	9.2	D	0.7	0.7	1.6	0.6	3.8	0.4	34.8	45.8
Furniture and related products	337	12,647	10.0	0.5	1.0	0.6	2.3	0.2	4.0	2.4	31.0	49.9
Miscellaneous	339	20,669	7.8	1.5	1.1	0.7	1.3	0.5	3.3	1.8	28.8	53.0
Medical equipment and supplies	3391	8,060	8.8	1.7	1.4	1.0	1.4	1.0	4.1	2.7	27.0	50.9
Other miscellaneous manufacturing	3399	12,608	7.1	1.4	0.9	0.6	1.3	0.2	2.9	1.2	29.9	54.4
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	6.8	1.1	0.8	0.5	1.0	1.0	4.1	1.3	30.4	54.5
Agriculture, forestry, fishing, and hunting	11	21,606	5.6	D	D	D	0.8	D	0.9	0.8	43.6	48.5
Mining, extraction, and support activities	21	14,969	4.2	0.5	0.7	0.2	1.0	0.1	3.2	0.8	37.8	50.2
Utilities	22	2,684	6.2	1.2	0.9	1.3	2.1	1.0	6.0	1.4	31.0	50.4
Construction	23	613,110	5.6	0.5	0.6	0.3	0.7	0.3	2.8	0.9	38.0	50.3
Wholesale trade	42	257,153	7.4	0.9	1.0	0.8	1.3	0.7	3.9	1.2	30.2	53.2
Retail trade	44–45	560,952	8.1	0.7	0.8	0.5	1.1	0.6	2.7	1.3	34.8	50.7
Transportation and warehousing	48–49	152,463	7.3	0.8	1.0	0.4	0.9	1.5	2.7	1.4	34.3	49.8
Information	51	61,638	6.3	1.9	0.9	0.4	2.1	0.7	5.1	2.3	16.6	66.1
Publishing	511	17,590	6.3	1.9	0.6	0.2	2.4	0.8	6.6	2.9	15.1	65.8
Newspaper, periodical, book, and directory publishers	5111	9,761	6.9	1.1	0.9	0.2	1.7	0.4	6.5	1.8	19.5	61.8
Software publishers	5112	7,828	5.5	2.8	0.3	0.2	3.3	1.5	6.6	4.3	9.7	70.8
Telecommunications	517	7,164	8.2	1.7	1.2	0.7	1.5	1.2	5.8	3.6	17.4	62.0
Data processing, hosting, and related services	518	8,918	5.8	2.2	1.1	0.3	2.9	1.7	6.5	2.6	8.7	71.4
Other information	other 51	27,965	6.0	2.0	0.8	0.5	1.7	0.2	3.5	1.5	19.9	65.6
Finance and insurance	52	200,857	5.1	1.1	0.7	0.5	0.7	2.6	6.6	1.2	18.4	64.3
Real estate and rental and leasing	53	255,783	4.5	0.8	0.8	0.5	0.8	0.6	3.3	0.8	28.8	59.7
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	D	0.0	D	D	0.0	D	D	8.6	21.2	63.0
Other real estate and rental and leasing	other 53	253,970	4.5	0.8	0.8	0.5	0.8	0.6	3.3	0.7	28.8	59.7
Professional, scientific, and technical services	54	695,672	5.9	1.7	0.7	0.6	1.2	1.1	7.8	1.6	18.7	62.6
Legal services	5411	152,243	5.5	1.7	0.7	0.5	1.1	1.6	9.6	1.5	17.8	61.5

**TABLE 110**  
**Factors adversely affecting technology adoption and utilization, by industry—cloud-based computing systems and applications: 2016–18**  
 (Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	8.1	2.5	0.7	0.8	1.0	1.7	14.8	1.1	12.1	60.3
Architectural, engineering, and related services	5413	88,491	6.8	1.7	0.8	0.6	1.3	0.4	7.4	1.6	23.0	59.3
Specialized design services	5414	26,282	4.8	0.7	0.5	r	D	D	3.5	0.8	27.0	61.8
Computer systems design and related services	5415	95,950	6.2	2.4	0.8	0.7	2.2	1.5	6.0	2.8	11.5	70.1
Management, scientific, and technical consulting services	5416	132,989	4.6	1.3	0.7	0.4	1.1	0.8	3.7	1.4	23.1	63.4
Scientific research and development services	5417	9,798	5.6	1.3	0.8	0.6	2.3	2.1	7.7	3.5	25.6	54.9
Advertising, public relations, and related services	5418	27,677	4.7	0.6	0.4	0.6	0.6	0.4	3.6	2.0	20.2	67.4
Other professional, scientific, and technical services	5419	55,569	5.7	1.5	0.9	0.7	1.1	0.7	6.7	1.4	23.1	59.4
Management of companies and enterprises	55	2,409	1.8	r	0.0	D	D	D	D	0.0	26.8	68.5
Administrative and support and waste management and remediation services	56	287,807	6.7	0.6	0.6	0.4	0.9	0.5	2.9	1.4	32.4	54.0
Educational services	61	53,912	4.9	0.8	0.5	D	1.0	0.3	2.7	0.9	29.5	59.8
Health care and social assistance	62	519,556	8.3	2.0	0.6	0.8	1.0	2.9	6.3	1.8	25.6	54.9
Health care services	621–23	459,855	8.6	2.2	0.7	0.8	1.0	3.1	6.8	1.8	24.4	55.4
Social assistance	624	59,700	6.6	0.7	0.6	0.2	r	0.7	2.8	1.6	34.8	50.9
Arts, entertainment, and recreation	71	88,831	4.7	0.7	0.5	0.2	0.7	0.3	r	2.4	32.6	57.4
Accommodation and food services	72	453,059	8.8	1.1	1.0	0.5	0.9	0.5	1.9	1.2	36.5	49.1
Other services	81	345,125	6.9	0.7	0.8	0.5	0.9	0.4	2.3	1.3	38.1	48.9

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. Detail may exceed total because companies could select more than one response. 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.



TABLE 111

## Factors adversely affecting technology adoption and utilization, by industry—specialized software: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
All industries	11, 21–23, 31–33, 42–81	4,805,151	8.3	0.8	0.6	0.4	1.0	0.9	1.3	1.6	29.0	56.9
Manufacturing industries	31–33	217,565	12.5	0.7	0.7	0.4	2.1	0.3	0.9	3.1	26.0	54.9
Food	311	18,250	12.0	0.7	0.7	0.5	1.6	0.2	1.1	2.8	32.8	47.7
Beverage and tobacco products	312	7,723	15.0	1.3	0.7	0.5	1.6	0.4	0.8	3.9	21.0	56.8
Textile, apparel, and leather products	313–16	10,554	14.1	0.4	0.2	0.7 r	1.8	0.1 r	1.0 r	2.2	28.3	51.2
Wood products	321	11,012	9.0	0.4 r	0.6 r	0.1	0.7	0.5 r	0.3 r	2.1	33.2	50.6
Paper	322	2,117	7.1	D	2.6 r	D	3.6 r	0.0	0.4	7.7 r	36.8	48.0
Printing and related support activities	323	20,851	11.4	0.9	0.2 r	0.2	0.9	0.2	0.8	2.8	22.3	59.7
Petroleum and coal products	324	583	4.5 r	D	0.0	0.0	3.6 r	D	D	D	23.3	65.2
Chemicals	325	7,522	12.0	0.3	1.3	0.6	1.8	0.6	1.3	3.0	25.5	56.8
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	9.1 r	D	0.0	0.0	0.0	0.0	0.0	D	27.8	61.2
Pharmaceuticals and medicines	3254	1,365	11.7	0.8 r	0.9 r	0.4 r	2.7	1.2	1.9	4.0	23.5	56.6
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	16.1	D	1.0 r	1.0 r	3.5 r	0.2 r	1.5 r	7.3	21.3	55.0
Other chemicals	other 325	3,927	10.9	0.2 r	1.7 r	0.5 r	1.0	0.6	1.1	1.3	27.5	57.0
Plastics and rubber products	326	8,087	12.2	0.5	1.7	0.9 r	4.4	0.0	1.6 r	3.7	26.5	52.3
Nonmetallic mineral products	327	7,749	9.7	1.1 r	0.8 r	0.7 r	2.2	0.8 r	1.1 r	3.0	34.0	51.1
Primary metals	331	2,537	20.4	0.7	0.4	0.3	2.2 r	D	1.5	4.9 r	21.5	50.7
Fabricated metal products	332	48,472	13.3	0.5	0.5	0.4 r	2.2	0.2 r	0.6	2.8	25.1	56.4
Machinery	333	18,558	12.5	1.2	0.6 r	0.2	2.5	0.2 r	1.6	2.2	24.3	57.4
Computer and electronic products	334	9,036	10.1	0.9	1.1	0.8	4.0	0.7	2.0	4.2	20.5	60.3
Communications equipment	3342	974	8.3	0.5	D	D	3.1 r	D	2.1 r	4.2	17.7	66.0
Semiconductor and other electronic components	3344	2,796	10.6	0.6	1.3 r	0.3 r	3.5	0.9 r	3.1	4.0	24.3	53.7
Navigational, measuring, electromedical, and control instruments	3345	3,909	8.9	0.7 r	1.2 r	1.1 r	5.2	0.6 r	1.0	4.7	19.2	63.1
Other computer and electronic products	other 334	1,359	13.6	2.2 r	D	D	2.2	D	2.4	3.4	18.3	62.0
Electrical equipment, appliances, and components	335	4,000	13.9	0.7 r	1.2 r	0.4 r	2.6	0.8 r	1.2	3.9	20.6	59.1
Transportation equipment	336	7,175	12.6	0.5	2.2	1.3	3.3	0.7	1.3	4.5	25.7	53.3
Automobiles, bodies, trailers, and parts	3361–63	4,565	13.0	0.6 r	3.1	1.8 r	4.0	0.5	1.7 r	5.0	23.8	53.9

TABLE 111

## Factors adversely affecting technology adoption and utilization, by industry—specialized software: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology				
Aerospace products and parts	3364	985	13.3	0.8	1.0	r	0.8	3.2	1.8	1.7	6.4	21.4	57.5			
Other transportation	other 336	1,625	11.1	0.0	0.7		D	1.4	r	0.3	r	D	1.8	r	33.2	49.3
Furniture and related products	337	12,647	14.6	0.4	r	1.0	r	0.2	2.9	0.3	r	0.8	r	4.0	25.9	53.6
Miscellaneous	339	20,669	13.2	1.2	0.5	r	0.4	1.6	0.2	0.5	3.0	24.3	55.3			
Medical equipment and supplies	3391	8,060	16.5	2.0	r	0.2	0.4	r	1.9	0.4	r	0.4	4.1	21.4	53.0	
Other miscellaneous manufacturing	3399	12,608	11.2	0.7	r	0.6	r	0.3	1.3	0.1	0.5	2.3	26.2	56.8		
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	8.1	0.8	0.6	0.4	0.9	1.0	1.3	1.5	29.2	56.9				
Agriculture, forestry, fishing, and hunting	11	21,606	7.1	0.8	0.0	D	0.5	r	0.3	r	D	1.4	40.5	49.8		
Mining, extraction, and support activities	21	14,969	5.5	0.3	r	0.8	r	0.5	r	1.4	0.1	1.6	0.5	36.6	52.9	
Utilities	22	2,684	4.8	0.7	r	0.8	1.6	r	1.1	0.9	r	1.2	2.6	30.9	56.7	
Construction	23	613,110	7.0	0.4	0.5	0.4	0.9	0.3	0.8	1.0	37.3	51.3				
Wholesale trade	42	257,153	8.7	0.7	0.8	0.5	1.3	0.6	0.9	1.6	31.7	53.8				
Retail trade	44–45	560,952	9.5	0.6	0.6	0.4	1.0	0.6	1.1	1.7	32.5	52.9				
Transportation and warehousing	48–49	152,463	8.9	1.0	0.7	0.5	0.8	2.2	1.4	1.5	33.3	49.7				
Information	51	61,638	7.5	1.3	0.6	0.4	2.0	0.6	1.1	3.2	16.9	68.1				
Publishing	511	17,590	7.8	1.2	r	0.3	0.3	r	2.0	0.7	1.0	3.6	16.0	68.8		
Newspaper, periodical, book, and directory publishers	5111	9,761	8.6	0.4	r	0.3	D	1.4	D	0.8	r	3.2	19.4	65.7		
Software publishers	5112	7,828	6.7	2.3	0.3	0.5	r	2.7	1.3	1.1	4.1	11.7	72.5			
Telecommunications	517	7,164	9.4	1.2	1.3	r	0.9	1.3	1.0	2.9	3.2	20.1	61.5			
Data processing, hosting, and related services	518	8,918	6.4	1.4	1.0	r	0.2	2.1	0.6	1.4	3.9	12.8	72.7			
Other information	other 51	27,965	7.2	1.4	0.5	0.3	r	2.2	0.5	0.6	2.8	18.0	68.0			
Finance and insurance	52	200,857	5.8	1.0	0.8	0.5	0.8	2.3	3.0	1.3	17.4	67.7				
Real estate and rental and leasing	53	255,783	5.8	0.8	0.6	0.3	0.7	0.6	1.1	0.9	28.7	60.9				
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	11.9	0.0	0.0	D	D	0.0	0.0	10.9	30.3	55.3				
Other real estate and rental and leasing	other 53	253,970	5.8	0.8	0.6	0.3	0.7	0.6	1.2	0.9	28.7	60.9				
Professional, scientific, and technical services	54	695,672	7.6	1.0	0.5	0.4	1.2	1.2	1.6	1.7	18.6	67.0				
Legal services	5411	152,243	8.0	1.1	0.4	0.4	0.8	1.3	2.2	1.3	18.9	65.7				

TABLE 111

**Factors adversely affecting technology adoption and utilization, by industry—specialized software: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	6.8	0.7	0.5	0.4	0.7	2.9	3.4	0.8	10.6	73.1
Architectural, engineering, and related services	5413	88,491	10.9	1.1	0.5	0.2	1.5	0.6	0.9	2.5	16.1	67.3
Specialized design services	5414	26,282	8.6	0.6	0.4	D	0.5	D	1.1	1.1	26.0	61.6
Computer systems design and related services	5415	95,950	6.7	1.2	0.7	0.4	2.0	0.9	1.2	2.6	14.0	72.1
Management, scientific, and technical consulting services	5416	132,989	6.3	0.8	0.5	0.4	1.1	0.8	1.0	1.8	25.6	62.3
Scientific research and development services	5417	9,798	8.3	1.4	0.7	0.4	1.8	0.8	1.5	4.2	23.0	59.5
Advertising, public relations, and related services	5418	27,677	6.1	0.5	0.5	0.3	1.1	0.4 r	0.7	1.6	23.7	65.0
Other professional, scientific, and technical services	5419	55,569	7.7	0.9	0.5	0.5	1.4	1.0	1.1	1.6	20.7	66.2
Management of companies and enterprises	55	2,409	4.9	D	0.0	D	0.0	D	0.0	0.0	27.3	67.1
Administrative and support and waste management and remediation services	56	287,807	8.1	0.6	0.5	0.4	0.7	0.5	1.0	1.4	31.8	55.1
Educational services	61	53,912	6.3	0.8	0.4	0.3 r	0.9	0.2 r	1.2	1.0	28.6	61.0
Health care and social assistance	62	519,556	9.4	1.5	0.6	0.5	0.9	2.8	2.7	1.9	22.9	60.0
Health care services	621–23	459,855	9.6	1.6	0.6	0.6	0.9	3.0	2.9	1.9	21.6	61.0
Social assistance	624	59,700	7.9	0.8	0.6	0.3 r	0.7	1.0	1.1	2.0	33.6	52.3
Arts, entertainment, and recreation	71	88,831	5.4	0.5	0.6	D	0.4	D	0.6	1.6	31.0	59.8
Accommodation and food services	72	453,059	9.6	0.8	0.8	0.5	0.8	0.4	1.0	1.2	35.7	50.4
Other services	81	345,125	8.5	0.6	0.8	0.5	0.7	0.5	0.8	1.7	33.9	52.2

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

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. 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.

TABLE 112

## Factors adversely affecting technology adoption and utilization, by industry—robotics: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
All industries	11, 21–23, 31–33, 42–81	4,805,151	7.0	0.9	0.4	0.3	0.6	0.3	0.5	1.0	47.3	42.7
Manufacturing industries	31–33	217,565	16.1	1.4	0.6	0.2	2.1	0.3	0.7	3.3	36.9	42.7
Food	311	18,250	16.9	1.1	0.6	r 0.1	1.7	0.1	0.5	3.5	39.5	39.2
Beverage and tobacco products	312	7,723	18.2	1.5	0.5	r 0.2	1.7	0.2	0.6	3.8	34.8	43.0
Textile, apparel, and leather products	313–16	10,554	14.6	1.6	0.6	r 0.2	1.5	D	0.6	r 1.7	38.6	43.3
Wood products	321	11,012	15.4	2.3	1.1	r 0.4	1.7	D	0.1	2.6	35.8	42.7
Paper	322	2,117	15.6	1.2	D	D	4.3	r 0.0	0.4	8.7	r 47.0	32.7
Printing and related support activities	323	20,851	11.0	1.4	0.5	r 0.1	r 1.0	D	0.2	1.2	43.4	43.3
Petroleum and coal products	324	583	15.4	r 1.0	D	D	3.6	r D	D	D	33.1	47.5
Chemicals	325	7,522	18.0	1.9	r 1.1	r 0.3	1.4	0.6	1.0	4.2	36.7	40.5
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	9.3	r D	D	0.0	0.0	0.0	0.0	0.8	r 44.7	45.4
Pharmaceuticals and medicines	3254	1,365	17.9	1.8	D	D	0.8	r 0.4	r 0.8	r 4.7	38.4	39.9
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	19.9	0.7	0.8	r 0.6	r 3.0	r D	0.6	r 9.9	r 28.9	43.8
Other chemicals	other 325	3,927	18.5	2.7	r 1.6	r D	1.1	1.0	r 1.4	r 2.1	38.1	38.6
Plastics and rubber products	326	8,087	20.9	1.4	0.6	0.3	r 3.8	0.4	1.5	r 5.7	33.4	37.9
Nonmetallic mineral products	327	7,749	14.0	1.4	r 0.7	r 0.6	r 2.2	0.9	r 0.9	r 1.9	41.8	42.2
Primary metals	331	2,537	29.3	1.2	0.9	r D	2.6	r D	0.3	7.7	r 23.0	41.0
Fabricated metal products	332	48,472	18.4	0.7	0.4	0.1	2.1	0.3	0.6	3.7	34.5	43.4
Machinery	333	18,558	13.9	2.0	0.9	0.4	r 2.8	0.2	1.5	2.9	34.8	46.8
Computer and electronic products	334	9,036	11.4	1.9	0.8	0.6	r 3.1	0.4	0.8	4.4	37.3	46.1
Communications equipment	3342	974	9.7	1.5	r D	D	3.0	r 0.0	D	2.3	44.1	41.1
Semiconductor and other electronic components	3344	2,796	13.0	2.4	0.9	r 0.2	1.9	0.4	r 0.5	4.5	34.5	46.0
Navigational, measuring, electromedical, and control instruments	3345	3,909	10.5	1.8	0.5	0.3	4.3	0.6	r 0.7	r 5.4	36.9	47.8
Other computer and electronic products	other 334	1,359	12.0	1.9	r D	1.3	r 1.9	r D	1.0	r 3.0	39.1	45.0
Electrical equipment, appliances, and components	335	4,000	19.3	2.2	1.6	r D	1.8	0.4	r 0.6	4.5	34.6	42.3
Transportation equipment	336	7,175	18.9	0.8	1.2	r 0.7	r 3.4	0.3	1.1	r 5.3	32.0	43.4
Automobiles, bodies, trailers, and parts	3361–63	4,565	19.6	0.4	1.8	r 0.8	r 4.0	0.2	1.4	r 6.5	29.2	44.0

TABLE 112

## Factors adversely affecting technology adoption and utilization, by industry—robotics: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Aerospace products and parts	3364	985	19.6	2.5	D	0.7	3.2	0.5	1.3	6.2	32.2	43.8
Other transportation	other 336	1,625	16.7	1.0	D	D	2.0	D	D	1.3	39.6	41.5
Furniture and related products	337	12,647	15.9	1.2 r	0.3	0.0	2.9	0.1	0.6 r	3.1	38.2	41.0
Miscellaneous	339	20,669	14.9	2.3	0.3	0.2	1.4	0.2	0.3	3.2	38.2	42.4
Medical equipment and supplies	3391	8,060	16.5	3.2	0.2 r	0.2 r	1.5	0.4 r	0.3 r	2.6	33.8	44.0
Other miscellaneous manufacturing	3399	12,608	13.8	1.8	0.4	0.2 r	1.3	0.2 r	0.3 r	3.6	41.0	41.4
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	6.6	0.9	0.4	0.3	0.6	0.3	0.5	0.8	47.8	42.7
Agriculture, forestry, fishing, and hunting	11	21,606	6.3	1.3	0.0	D	D	D	D	0.8	52.0	39.4
Mining, extraction, and support activities	21	14,969	5.9	1.1	1.3 r	0.1	1.1	0.1	0.5	0.3 r	47.5	42.5
Utilities	22	2,684	5.9	0.8	0.3 r	D	0.8 r	1.0 r	0.6	1.1	48.0	42.5
Construction	23	613,110	6.0	0.5	0.4	0.2	0.6	0.2	0.3	0.7	50.0	41.5
Wholesale trade	42	257,153	8.5	1.1	0.7	0.3	0.9	0.2	0.5	1.5	45.7	42.3
Retail trade	44–45	560,952	8.9	0.6	0.5	0.2	0.7	0.2	0.3	1.1	46.6	41.9
Transportation and warehousing	48–49	152,463	7.9	1.1	0.3	0.2	0.4	0.6	0.6	0.9	45.2	43.0
Information	51	61,638	4.5	0.9	0.4	0.2	0.6	0.3	0.4	0.9	47.6	44.6
Publishing	511	17,590	4.3	0.5	0.4	0.3 r	0.8	0.1 r	0.3 r	0.6	48.2	45.1
Newspaper, periodical, book, and directory publishers	5111	9,761	5.2	0.3	0.6	0.4 r	0.9	D	0.5 r	0.8	46.4	45.7
Software publishers	5112	7,828	3.1	0.8	0.1	0.1	0.8 r	D	D	0.3	50.4	44.4
Telecommunications	517	7,164	6.0	0.9	0.7 r	0.5 r	0.5 r	0.9	0.8 r	0.8	44.6	45.0
Data processing, hosting, and related services	518	8,918	4.5	1.2	1.0 r	0.3 r	0.6	0.3 r	0.1	1.8	47.6	44.1
Other information	other 51	27,965	4.2	1.0	0.2	D	0.6	0.2	0.5	0.7	48.1	44.3
Finance and insurance	52	200,857	3.7	0.8	0.5	0.3	0.4	0.6	0.5	0.5	43.6	48.7
Real estate and rental and leasing	53	255,783	4.0	0.4	0.3	0.2	0.3	0.3	0.3	0.3	48.5	45.0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	9.3	0.0	D	0.0	D	0.0	0.0	7.8	39.7	48.5
Other real estate and rental and leasing	other 53	253,970	3.9	0.4	0.3	0.2	0.3	0.3	0.3	0.3	48.5	45.0
Professional, scientific, and technical services	54	695,672	4.5	0.9	0.3	0.2	0.6	0.3	0.4	0.8	48.9	43.5
Legal services	5411	152,243	3.1	0.8	0.2	0.3	0.3	0.4	0.4	0.5	51.9	41.6

**TABLE 112**  
**Factors adversely affecting technology adoption and utilization, by industry—robotics: 2016–18**  
 (Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	5.1	1.3	0.2	0.2	0.4	0.6	0.9	0.5	44.5	46.3
Architectural, engineering, and related services	5413	88,491	5.9	0.9	0.5	0.3	1.0	0.3	0.5	1.3	49.2	42.2
Specialized design services	5414	26,282	4.0	0.2	D	D	0.3	0.0	0.4	0.7	57.4	36.8
Computer systems design and related services	5415	95,950	4.9	1.3	0.6	0.4	1.1	0.3	0.4	1.2	47.3	44.4
Management, scientific, and technical consulting services	5416	132,989	3.9	0.7	0.2	0.2	0.5	0.3	0.1	0.7	47.7	46.0
Scientific research and development services	5417	9,798	8.0	1.8	0.5	0.1	2.0	0.6	0.7	3.9	45.8	40.3
Advertising, public relations, and related services	5418	27,677	4.1	0.7	0.4	0.1	0.6	0.1	0.1	1.0	48.3	45.1
Other professional, scientific, and technical services	5419	55,569	5.1	0.5	0.1	D	0.7	0.4	0.2	0.5	51.0	41.3
Management of companies and enterprises	55	2,409	5.6	D	D	D	D	D	D	D	39.5	54.4
Administrative and support and waste management and remediation services	56	287,807	6.8	0.9	0.3	0.2	0.4	0.2	0.5	0.7	48.3	42.3
Educational services	61	53,912	4.4	0.8	0.5	0.3	0.4	0.2	0.3	0.4	51.3	42.3
Health care and social assistance	62	519,556	6.5	1.6	0.4	0.4	0.5	0.6	0.7	0.9	48.8	41.4
Health care services	621–23	459,855	6.6	1.7	0.4	0.4	0.5	0.6	0.7	0.9	48.5	41.7
Social assistance	624	59,700	6.0	0.6	0.3	0.3	0.4	0.5	0.6	1.2	50.7	39.7
Arts, entertainment, and recreation	71	88,831	4.0	0.6	0.2	0.0	0.3	D	0.3	0.7	48.8	45.4
Accommodation and food services	72	453,059	9.4	1.2	0.5	0.3	0.7	0.3	0.6	0.9	45.9	41.7
Other services	81	345,125	7.6	0.6	0.4	0.3	0.5	0.2	0.4	1.0	47.8	41.8

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. Detail may exceed total because companies could select more than one response. 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.

TABLE 113

## Factors adversely affecting technology adoption and utilization, by industry—specialized equipment: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
All industries	11, 21–23, 31–33, 42–81	4,805,151	7.8	0.6	0.4	0.3	0.7	0.6	0.6	1.8	38.0	50.0
Manufacturing industries	31–33	217,565	14.6	0.7	0.5	0.2	1.9	0.4	0.5	4.6	24.6	54.8
Food	311	18,250	15.3	0.5	0.2	0.1	1.3	0.5	0.4	4.4	30.8	47.4
Beverage and tobacco products	312	7,723	17.1	0.5	0.4	0.1	1.4	0.7	0.4	7.3	18.3	56.9
Textile, apparel, and leather products	313–16	10,554	16.1	0.5	0.5	0.2 r	1.5	0.2 r	0.7 r	3.1	26.6	52.8
Wood products	321	11,012	13.4	1.1	0.7 r	0.3 r	1.2	0.5 r	0.5	2.8	27.2	52.3
Paper	322	2,117	10.8	0.1	D	0.0	1.9 r	0.0	1.2 r	9.0 r	35.3	47.7
Printing and related support activities	323	20,851	12.8	0.6 r	0.2	0.1	1.3	0.1	0.2	4.2	24.8	56.9
Petroleum and coal products	324	583	6.3 r	0.0	D	D	3.6 r	D	1.2	0.0	16.3	71.9
Chemicals	325	7,522	14.1	0.7 r	0.9 r	0.5	1.3	0.6	0.6	5.0	22.3	57.2
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	9.3 r	0.0	0.0	0.0	0.0	0.0	D	0.8 r	21.9	67.1
Pharmaceuticals and medicines	3254	1,365	14.1	0.7 r	D	0.4 r	0.9	0.5	0.9	7.0	21.4	57.4
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	17.5	0.2 r	1.0 r	0.6 r	3.5	D	0.3 r	11.6	19.4	51.8
Other chemicals	other 325	3,927	13.4	1.0 r	1.2 r	0.5 r	0.7	0.8 r	0.6	2.2	23.9	57.9
Plastics and rubber products	326	8,087	16.6	0.6	0.3	0.1	3.5 r	0.2	1.2 r	5.6	23.4	53.5
Nonmetallic mineral products	327	7,749	12.8	0.9 r	0.7 r	0.7 r	1.6	0.9 r	0.8 r	3.5	31.7	51.7
Primary metals	331	2,537	24.6	0.5	0.6 r	D	2.0 r	D	0.4	4.9	16.8	51.0
Fabricated metal products	332	48,472	14.2	0.5	0.5	0.3 r	2.2	0.2 r	0.3	5.0	23.2	56.4
Machinery	333	18,558	12.2	0.9	0.7 r	0.1	1.8	0.2 r	0.5 r	4.0	23.7	58.6
Computer and electronic products	334	9,036	10.5	0.6	1.1 r	0.3 r	2.9	0.5	0.5	6.0	21.5	61.3
Communications equipment	3342	974	6.2	D	D	D	3.1 r	D	D	4.9	25.5	62.3
Semiconductor and other electronic components	3344	2,796	12.4	0.5	0.3 r	D	3.0	0.5 r	0.5 r	6.8	19.5	59.9
Navigational, measuring, electromedical, and control instruments	3345	3,909	10.0	0.9	2.1 r	D	3.0	0.7 r	0.6 r	6.4	20.3	63.2
Other computer and electronic products	other 334	1,359	11.3	0.6 r	0.0	D	2.4	D	D	3.8	26.3	58.0
Electrical equipment, appliances, and components	335	4,000	15.1	0.6	1.2 r	D	2.7	D	0.4	5.7	20.1	57.6
Transportation equipment	336	7,175	16.1	0.6	1.4	0.5 r	2.6	0.8 r	1.3 r	6.6	23.4	53.3
Automobiles, bodies, trailers, and parts	3361–63	4,565	18.4	0.5 r	1.8 r	0.6 r	3.1	0.3	1.3 r	7.2	21.7	52.8

**TABLE 113**  
**Factors adversely affecting technology adoption and utilization, by industry—specialized equipment: 2016–18**  
 (Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Aerospace products and parts	3364	985	13.1	1.0 r	2.0 r	1.0 r	2.8	2.7 r	1.4	6.7	21.0	58.1
Other transportation	other 336	1,625	11.6	D	0.0	0.0	1.0	1.2 r	1.1 r	4.9	29.7	51.9
Furniture and related products	337	12,647	15.9	0.4 r	0.4 r	0.1	2.2	0.4 r	0.2 r	4.7	24.6	52.2
Miscellaneous	339	20,669	17.2	1.3	0.4	0.2	1.9	0.3	0.4 r	3.6	24.2	53.3
Medical equipment and supplies	3391	8,060	22.3	2.2	0.3 r	0.3 r	2.3	0.4 r	0.2	4.6	18.6	52.3
Other miscellaneous manufacturing	3399	12,608	14.0	0.7 r	0.5 r	D	1.7	0.2	0.5 r	3.0	27.8	53.9
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	7.5	0.6	0.4	0.3	0.6	0.6	0.6	1.6	38.6	49.8
Agriculture, forestry, fishing, and hunting	11	21,606	7.8	0.2 r	D	D	1.0	D	0.6 r	1.6	40.7	48.5
Mining, extraction, and support activities	21	14,969	6.3	0.7 r	0.6 r	0.1	1.1	0.4 r	0.7 r	1.5	39.8	49.8
Utilities	22	2,684	5.0	0.4	0.4 r	0.4 r	0.5	1.0 r	0.4	2.4	35.8	54.1
Construction	23	613,110	6.6	0.3	0.5	0.2	0.6	0.4	0.4	1.4	41.0	48.7
Wholesale trade	42	257,153	7.9	0.6	0.5	0.3	0.8	0.4	0.4	1.9	38.7	48.9
Retail trade	44–45	560,952	9.1	0.5	0.5	0.3	0.8	0.5	0.5	1.8	39.0	48.1
Transportation and warehousing	48–49	152,463	8.8	0.8	0.5	0.3	0.6	1.9	0.8	1.6	37.9	47.6
Information	51	61,638	6.5	0.6	0.5	0.2	1.0	0.3	0.4	2.6	33.5	55.4
Publishing	511	17,590	5.1	0.3	0.3	0.1 r	0.9	0.3 r	0.3	2.1	38.5	52.6
Newspaper, periodical, book, and directory publishers	5111	9,761	6.0	0.4	0.4 r	0.2 r	0.9	D	0.2	1.6	38.2	52.6
Software publishers	5112	7,828	4.0	0.2 r	0.2	D	0.9 r	0.5 r	0.3 r	2.7	39.0	52.7
Telecommunications	517	7,164	8.3	0.8	0.8 r	0.4 r	1.6	1.0 r	1.6	3.5	30.0	55.8
Data processing, hosting, and related services	518	8,918	4.5	0.8	1.1 r	0.1 r	0.8	0.5	0.4	2.5	33.9	57.2
Other information	other 51	27,965	7.5	0.6	0.4	0.2 r	0.9	0.2	0.2	2.7	31.1	56.5
Finance and insurance	52	200,857	3.9	0.4	0.5	0.4	0.3	1.0	0.9	0.7	38.3	53.0
Real estate and rental and leasing	53	255,783	4.3	0.2	0.3	0.2	0.3	0.4	0.3	0.8	43.8	49.0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	9.3	0.0	D	0.0	D	0.0	0.0	8.6	39.0	49.2
Other real estate and rental and leasing	other 53	253,970	4.3	0.2	0.3	0.2	0.3	0.4	0.3	0.8	43.8	49.0
Professional, scientific, and technical services	54	695,672	5.5	0.6	0.3	0.2	0.6	0.5	0.6	1.5	39.0	51.5
Legal services	5411	152,243	4.0	0.5	0.3	0.2	0.4	0.4	0.8	0.8	45.2	46.7



TABLE 113

**Factors adversely affecting technology adoption and utilization, by industry—specialized equipment: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	5.1	0.4	0.2 r	0.2	0.4	1.2	1.1	0.8	37.7	52.6
Architectural, engineering, and related services	5413	88,491	8.7	1.2	0.3	0.3	0.9	0.5	0.3	2.6	32.4	55.0
Specialized design services	5414	26,282	5.7	0.4 r	D	D	0.4 r	0.0	0.9	1.6	46.0	44.7
Computer systems design and related services	5415	95,950	5.0	0.8	0.5	0.2	0.9	0.5	0.7	2.1	37.2	53.1
Management, scientific, and technical consulting services	5416	132,989	4.0	0.4	0.2	0.2	0.6	0.4	0.2	1.3	41.5	51.2
Scientific research and development services	5417	9,798	9.7	1.3	0.6	0.4	1.5	0.6	0.6	6.6	27.5	54.2
Advertising, public relations, and related services	5418	27,677	4.3	0.6	0.4	0.0	0.5	0.3	0.2 r	1.5	40.0	52.4
Other professional, scientific, and technical services	5419	55,569	9.0	0.7	0.2 r	0.0	0.9	0.6	0.5	1.9	30.4	56.7
Management of companies and enterprises	55	2,409	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	62.8
Administrative and support and waste management and remediation services	56	287,807	7.2	0.4	0.3	0.2	0.5	0.4	0.5	1.7	39.9	49.1
Educational services	61	53,912	5.0	0.7	D	D	0.2 r	0.6	D	0.8	44.5	47.3
Health care and social assistance	62	519,556	9.8	1.1	0.5	0.3	0.7	1.2	1.0	2.1	32.0	53.3
Health care services	621–23	459,855	10.3	1.2	0.5	0.4	0.6	1.3	1.1	2.1	30.0	54.8
Social assistance	624	59,700	6.2	0.3	0.5	0.1 r	0.7	0.2	0.7	1.9	47.4	41.8
Arts, entertainment, and recreation	71	88,831	4.9	0.4	0.3	0.1 r	0.4	D	0.2	1.6	40.2	52.3
Accommodation and food services	72	453,059	9.7	0.8	0.6	0.4	0.6	0.4	0.6	1.7	39.9	46.6
Other services	81	345,125	9.1	0.4	0.6	0.3	0.6	0.7	0.6	2.2	36.4	49.7

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

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. 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.

TABLE 114

**Companies that reported selling artificial intelligence or goods and services that included artificial intelligence, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Yes	No	Don't know
All industries	11, 21–23, 31–33, 42–81	4,805,151	0.4	92.8	6.8
Manufacturing industries	31–33	217,565	0.4	92.4	7.2
Food	311	18,250	0.2	90.1	9.7
Beverage and tobacco products	312	7,723	0.0	93.0	7.0
Textile, apparel, and leather products	313–16	10,554	0.1	89.0	10.9
Wood products	321	11,012	0.0	92.6	7.4
Paper	322	2,117	D	95.7	4.2
Printing and related support activities	323	20,851	0.3	93.2	6.5
Petroleum and coal products	324	583	0.0	94.7	5.3
Chemicals	325	7,522	0.3	93.5	6.2
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	0.0	95.1	4.9
Pharmaceuticals and medicines	3254	1,365	D	94.2	5.8
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	D	94.6	5.3
Other chemicals	other 325	3,927	D	92.5	7.0
Plastics and rubber products	326	8,087	0.1	94.9	5.0
Nonmetallic mineral products	327	7,749	D	94.1	5.8
Primary metals	331	2,537	0.0	92.7	7.3
Fabricated metal products	332	48,472	0.3	93.7	6.0
Machinery	333	18,558	1.2	91.3	7.5
Computer and electronic products	334	9,036	1.6	90.2	8.2
Communications equipment	3342	974	0.9	89.8	9.3
Semiconductor and other electronic components	3344	2,796	0.4	91.6	8.0
Navigational, measuring, electromedical, and control instruments	3345	3,909	2.4	90.0	7.6
Other computer and electronic products	other 334	1,359	2.2	88.2	9.6
Electrical equipment, appliances, and components	335	4,000	2.0	89.3	8.7
Transportation equipment	336	7,175	0.2	92.4	7.4
Automobiles, bodies, trailers, and parts	3361–63	4,565	0.2	91.1	8.7
Aerospace products and parts	3364	985	D	91.5	8.1
Other transportation	other 336	1,625	D	96.5	3.4
Furniture and related products	337	12,647	0.1	92.9	7.0
Miscellaneous	339	20,669	0.2	92.4	7.4
Medical equipment and supplies	3391	8,060	0.5	90.1	9.4
Other miscellaneous manufacturing	3399	12,608	0.0	94.0	6.0
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	0.4	92.8	6.8
Agriculture, forestry, fishing, and hunting	11	21,606	0.0	96.9	3.1
Mining, extraction, and support activities	21	14,969	D	94.8	5.2
Utilities	22	2,684	0.2	94.8	5.0
Construction	23	613,110	0.2	94.5	5.3
Wholesale trade	42	257,153	0.5	92.1	7.4
Retail trade	44–45	560,952	0.3	92.4	7.3
Transportation and warehousing	48–49	152,463	0.1	90.9	9.0
Information	51	61,638	2.1	90.6	7.3
Publishing	511	17,590	2.4	91.1	6.5
Newspaper, periodical, book, and directory publishers	5111	9,761	0.2	94.9	4.9
Software publishers	5112	7,828	5.2	86.4	8.4
Telecommunications	517	7,164	2.4	85.7	11.9
Data processing, hosting, and related services	518	8,918	5.8	87.0	7.2
Other information	other 51	27,965	0.6	92.7	6.7
Finance and insurance	52	200,857	0.4	91.7	7.9

TABLE 114

**Companies that reported selling artificial intelligence or goods and services that included artificial intelligence, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Yes	No	Don't know	
Real estate and rental and leasing	53	255,783	0.1	93.4	6.5	
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	0.0	96.7	3.3	r
Other real estate and rental and leasing	other 53	253,970	0.1	93.3	6.6	
Professional, scientific, and technical services	54	695,672	1.2	92.4	6.4	
Legal services	5411	152,243	0.3	93.2	6.5	
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	0.4	92.4	7.2	
Architectural, engineering, and related services	5413	88,491	0.7	94.0	5.3	
Specialized design services	5414	26,282	0.6	95.0	4.4	
Computer systems design and related services	5415	95,950	4.7	87.5	7.8	
Management, scientific, and technical consulting services	5416	132,989	0.9	93.3	5.8	
Scientific research and development services	5417	9,798	2.8	90.6	6.6	
Advertising, public relations, and related services	5418	27,677	0.7	94.4	4.9	
Other professional, scientific, and technical services	5419	55,569	0.6	92.8	6.6	
Management of companies and enterprises	55	2,409	D	92.3	5.5	r
Administrative and support and waste management and remediation services	56	287,807	0.3	93.6	6.1	
Educational services	61	53,912	0.2	r 95.5	4.3	
Health care and social assistance	62	519,556	0.3	93.5	6.2	
Health care services	621–23	459,855	0.3	93.6	6.1	
Social assistance	624	59,700	0.0	93.7	6.3	
Arts, entertainment, and recreation	71	88,831	D	94.3	5.6	
Accommodation and food services	72	453,059	0.2	90.5	9.3	
Other services	81	345,125	0.2	92.4	7.4	

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

TABLE 115

**Companies that reported selling artificial intelligence or goods and services that included artificial intelligence, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	Yes	No	Don't know
All companies	4,805,151	0.4	92.8	6.8
Micro companies				
1–4	2,667,724	0.4	92.7	6.9
5–9	936,576	0.4	92.7	6.9
Small companies				
10–19	579,513	0.5	93.0	6.5
20–49	402,199	0.5	92.8	6.7
Medium companies				
50–99	119,497	0.6	93.1	6.3
100–249	65,565	0.6	92.3	7.1
Large companies				
250–499	18,897	1.2	91.2	7.6
500–999	7,289	1.1	89.7	9.2
1,000–4,999	6,199	1.2	86.2	12.6 r
5,000–9,999	823	3.5	79.7	16.8
10,000–24,999	514	3.9	70.8	25.3
25,000 or more	358	5.0	60.3	34.7 r

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 116

**Companies that reported selling cloud-based computing systems and applications or goods and services that included cloud-based computing systems and applications, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Yes	No	Don't know
All industries	11, 21–23, 31–33, 42–81	4,805,151	3.2	90.3	6.5
Manufacturing industries	31–33	217,565	1.6	92.4	6.0
Food	311	18,250	1.3	90.8	7.9
Beverage and tobacco products	312	7,723	1.0	93.2	5.8
Textile, apparel, and leather products	313–16	10,554	1.3	89.7	9.0
Wood products	321	11,012	0.9	93.5	5.6
Paper	322	2,117	0.3	96.0	3.7
Printing and related support activities	323	20,851	2.9	91.5	5.6
Petroleum and coal products	324	583	0.0	96.1	3.9
Chemicals	325	7,522	2.3	91.1	6.6
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	8.1	88.4	3.5
Pharmaceuticals and medicines	3254	1,365	1.3	92.4	6.3
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	1.6	93.3	5.1
Other chemicals	other 325	3,927	2.0	90.1	7.9
Plastics and rubber products	326	8,087	1.5	93.9	4.6
Nonmetallic mineral products	327	7,749	1.1	94.8	4.1
Primary metals	331	2,537	0.2	92.9	6.9
Fabricated metal products	332	48,472	0.6	94.3	5.1
Machinery	333	18,558	1.6	92.3	6.1
Computer and electronic products	334	9,036	5.8	85.7	8.5
Communications equipment	3342	974	11.4	77.9	10.8
Semiconductor and other electronic components	3344	2,796	1.4	90.6	8.0
Navigational, measuring, electromedical, and control instruments	3345	3,909	5.8	85.9	8.3
Other computer and electronic products	other 334	1,359	11.3	80.2	8.5
Electrical equipment, appliances, and components	335	4,000	2.9	90.6	6.5
Transportation equipment	336	7,175	1.4	92.6	6.0
Automobiles, bodies, trailers, and parts	3361–63	4,565	1.4	92.2	6.4
Aerospace products and parts	3364	985	1.7	90.8	7.5
Other transportation	other 336	1,625	1.1	94.9	4.0
Furniture and related products	337	12,647	1.0	93.7	5.3
Miscellaneous	339	20,669	2.7	90.9	6.4
Medical equipment and supplies	3391	8,060	3.0	87.5	9.5
Other miscellaneous manufacturing	3399	12,608	2.6	93.0	4.4
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	3.2	90.3	6.5
Agriculture, forestry, fishing, and hunting	11	21,606	0.9	96.8	2.3
Mining, extraction, and support activities	21	14,969	0.3	95.6	4.1
Utilities	22	2,684	0.5	94.9	4.6
Construction	23	613,110	1.3	93.7	5.0
Wholesale trade	42	257,153	3.0	90.2	6.8
Retail trade	44–45	560,952	1.9	91.1	7.0
Transportation and warehousing	48–49	152,463	1.4	90.7	7.9
Information	51	61,638	16.7	75.8	7.5
Publishing	511	17,590	22.4	71.8	5.8
Newspaper, periodical, book, and directory publishers	5111	9,761	3.2	91.7	5.1
Software publishers	5112	7,828	46.2	47.0	6.8
Telecommunications	517	7,164	17.4	69.3	13.3
Data processing, hosting, and related services	518	8,918	42.9	49.3	7.7
Other information	other 51	27,965	4.6	88.4	7.0

TABLE 116

**Companies that reported selling cloud-based computing systems and applications or goods and services that included cloud-based computing systems and applications, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Yes	No	Don't know
Finance and insurance	52	200,857	4.2	88.6	7.2
Real estate and rental and leasing	53	255,783	2.0	91.4	6.6
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	D	91.3	8.6
Other real estate and rental and leasing	other 53	253,970	2.0	91.4	6.6
Professional, scientific, and technical services	54	695,672	8.7	85.8	5.5
Legal services	5411	152,243	2.7	92.2	5.1
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	6.7	87.7	5.6
Architectural, engineering, and related services	5413	88,491	4.9	90.2	4.9
Specialized design services	5414	26,282	4.2	91.4	4.4
Computer systems design and related services	5415	95,950	33.1	59.6	7.3
Management, scientific, and technical consulting services	5416	132,989	6.1	88.4	5.5
Scientific research and development services	5417	9,798	5.6	87.7	6.7
Advertising, public relations, and related services	5418	27,677	5.6	90.0	4.4
Other professional, scientific, and technical services	5419	55,569	3.2	91.7	5.1
Management of companies and enterprises	55	2,409	2.3	r 88.9	8.8
Administrative and support and waste management and remediation services	56	287,807	2.4	91.9	5.7
Educational services	61	53,912	4.2	91.2	4.6
Health care and social assistance	62	519,556	2.8	91.2	6.0
Health care services	621–23	459,855	2.9	91.1	6.0
Social assistance	624	59,700	1.9	92.1	6.0
Arts, entertainment, and recreation	71	88,831	1.3	93.3	5.4
Accommodation and food services	72	453,059	1.3	89.3	9.4
Other services	81	345,125	1.6	91.2	7.2

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.

**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.

TABLE 117

**Companies that reported selling cloud-based computing systems and applications or goods and services that included cloud-based computing systems and applications, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	Yes	No	Don't know
All companies	4,805,151	3.2	90.3	6.5
Micro companies				
1–4	2,667,724	2.9	90.7	6.4
5–9	936,576	3.3	90.1	6.6
Small companies				
10–19	579,513	3.4	90.3	6.3
20–49	402,199	3.6	90.0	6.4
Medium companies				
50–99	119,497	4.6	89.5	5.9
100–249	65,565	4.8	88.2	7.0
Large companies				
250–499	18,897	5.0	85.9	9.1
500–999	7,289	5.6	86.4	8.0
1,000–4,999	6,199	7.0 r	79.2	13.8 r
5,000–9,999	823	8.0	74.9	17.1
10,000–24,999	514	7.4	68.1	24.5
25,000 or more	358	13.3	51.5	35.2 r

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 118

**Companies that reported selling specialized software or goods and services that included specialized software, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Yes	No	Don't know
All industries	11, 21–23, 31–33, 42–81	4,805,151	3.9	89.1	7.0
Manufacturing industries	31–33	217,565	4.3	88.3	7.4
Food	311	18,250	1.6	89.0	9.4
Beverage and tobacco products	312	7,723	0.8	92.3	6.9
Textile, apparel, and leather products	313–16	10,554	1.9	87.1	11.0
Wood products	321	11,012	2.2	89.9	7.9
Paper	322	2,117	1.7	94.0	4.3
Printing and related support activities	323	20,851	4.8	88.5	6.7
Petroleum and coal products	324	583	D	92.3	5.0
Chemicals	325	7,522	2.5	90.3	7.2
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	D	95.4	4.4
Pharmaceuticals and medicines	3254	1,365	3.4	90.1	6.5
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	1.9	92.8	5.3
Other chemicals	other 325	3,927	2.8	88.7	8.5
Plastics and rubber products	326	8,087	3.6	90.5	5.9
Nonmetallic mineral products	327	7,749	1.0	93.2	5.8
Primary metals	331	2,537	3.2	89.5	7.3
Fabricated metal products	332	48,472	3.1	90.7	6.2
Machinery	333	18,558	8.8	83.3	7.9
Computer and electronic products	334	9,036	17.7	72.9	9.4
Communications equipment	3342	974	23.5	65.4	11.1
Semiconductor and other electronic components	3344	2,796	9.5	82.1	8.4
Navigational, measuring, electromedical, and control instruments	3345	3,909	22.7	67.8	9.5
Other computer and electronic products	other 334	1,359	16.2	73.8	10.0
Electrical equipment, appliances, and components	335	4,000	9.6	82.7	7.7
Transportation equipment	336	7,175	5.0	88.8	6.2
Automobiles, bodies, trailers, and parts	3361–63	4,565	6.1	87.1	6.8
Aerospace products and parts	3364	985	6.0	85.9	8.1
Other transportation	other 336	1,625	1.3	95.3	3.4
Furniture and related products	337	12,647	2.8	90.3	6.9
Miscellaneous	339	20,669	4.9	87.1	8.0
Medical equipment and supplies	3391	8,060	5.8	83.5	10.7
Other miscellaneous manufacturing	3399	12,608	4.3	89.5	6.2
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	3.8	89.2	7.0
Agriculture, forestry, fishing, and hunting	11	21,606	0.8	96.3	2.9
Mining, extraction, and support activities	21	14,969	1.9	93.0	5.1
Utilities	22	2,684	1.6	93.3	5.1
Construction	23	613,110	1.5	93.1	5.4
Wholesale trade	42	257,153	4.3	87.8	7.9
Retail trade	44–45	560,952	2.4	90.4	7.2
Transportation and warehousing	48–49	152,463	1.6	89.2	9.2
Information	51	61,638	14.9	76.6	8.5
Publishing	511	17,590	23.1	69.4	7.5
Newspaper, periodical, book, and directory publishers	5111	9,761	3.3	91.1	5.6
Software publishers	5112	7,828	47.9	42.1	10.0
Telecommunications	517	7,164	10.3	75.6	14.1
Data processing, hosting, and related services	518	8,918	33.2	57.6	9.2
Other information	other 51	27,965	5.2	87.3	7.5



TABLE 118

**Companies that reported selling specialized software or goods and services that included specialized software, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Yes	No	Don't know
Finance and insurance	52	200,857	4.8	87.4	7.8
Real estate and rental and leasing	53	255,783	2.6	90.5	6.9
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	6.2	r 91.3	D
Other real estate and rental and leasing	other 53	253,970	2.6	90.5	6.9
Professional, scientific, and technical services	54	695,672	9.6	83.8	6.6
Legal services	5411	152,243	2.9	90.1	7.0
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	8.5	84.6	6.9
Architectural, engineering, and related services	5413	88,491	9.7	84.6	5.7
Specialized design services	5414	26,282	4.6	90.5	4.9
Computer systems design and related services	5415	95,950	31.3	60.5	8.2
Management, scientific, and technical consulting services	5416	132,989	6.2	87.9	5.9
Scientific research and development services	5417	9,798	10.0	82.4	7.6
Advertising, public relations, and related services	5418	27,677	4.8	90.1	5.1
Other professional, scientific, and technical services	5419	55,569	4.5	88.6	6.9
Management of companies and enterprises	55	2,409	3.7	r 90.8	5.5
Administrative and support and waste management and remediation services	56	287,807	3.0	90.9	6.1
Educational services	61	53,912	4.9	90.7	4.4
Health care and social assistance	62	519,556	3.5	90.2	6.3
Health care services	621–23	459,855	3.7	90.0	6.3
Social assistance	624	59,700	2.2	91.6	6.2
Arts, entertainment, and recreation	71	88,831	2.4	91.6	6.0
Accommodation and food services	72	453,059	1.5	89.0	9.5
Other services	81	345,125	2.5	90.0	7.5

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.

TABLE 119

**Companies that reported selling specialized software or goods and services that included specialized software, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	Yes	No	Don't know
All companies	4,805,151	3.9	89.1	7.0
Micro companies				
1–4	2,667,724	3.4	89.6	7.0
5–9	936,576	4.1	88.9	7.0
Small companies				
10–19	579,513	4.1	89.1	6.8
20–49	402,199	4.4	88.7	6.9
Medium companies				
50–99	119,497	5.5	87.7	6.8
100–249	65,565	5.7	86.8	7.5
Large companies				
250–499	18,897	7.3	83.2	9.5
500–999	7,289	6.4	85.3	8.3
1,000–4,999	6,199	7.3 r	78.3	14.4 r
5,000–9,999	823	8.5	72.9	18.5
10,000–24,999	514	10.3	63.8	25.9
25,000 or more	358	13.0	51.0	36.0 r

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 120

**Companies that reported selling robotics or goods and services that included robotics, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Yes	No	Don't know
All industries	11, 21–23, 31–33, 42–81	4,805,151	0.3	93.8	5.9
Manufacturing industries	31–33	217,565	1.4	93.1	5.5
Food	311	18,250	0.3	92.2	7.5
Beverage and tobacco products	312	7,723	0.1	94.2	5.7
Textile, apparel, and leather products	313–16	10,554	0.2	r 91.4	8.4
Wood products	321	11,012	0.7	r 94.0	5.3
Paper	322	2,117	0.5	96.4	3.1
Printing and related support activities	323	20,851	0.3	95.1	4.6
Petroleum and coal products	324	583	0.0	95.9	4.1
Chemicals	325	7,522	0.7	r 93.3	6.0
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	0.0	96.1	3.9
Pharmaceuticals and medicines	3254	1,365	D	93.1	6.6
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	0.0	95.4	4.6
Other chemicals	other 325	3,927	1.1	r 92.2	6.7
Plastics and rubber products	326	8,087	2.7	93.2	4.1
Nonmetallic mineral products	327	7,749	0.2	95.7	4.1
Primary metals	331	2,537	2.2	r 90.9	6.9
Fabricated metal products	332	48,472	1.1	94.4	4.5
Machinery	333	18,558	5.6	88.5	5.9
Computer and electronic products	334	9,036	3.5	89.4	7.1
Communications equipment	3342	974	0.8	r 90.9	8.3
Semiconductor and other electronic components	3344	2,796	2.8	90.2	7.0
Navigational, measuring, electromedical, and control instruments	3345	3,909	5.5	88.5	6.0
Other computer and electronic products	other 334	1,359	1.2	89.2	9.6
Electrical equipment, appliances, and components	335	4,000	2.3	91.4	6.3
Transportation equipment	336	7,175	2.1	92.4	5.5
Automobiles, bodies, trailers, and parts	3361–63	4,565	2.7	r 90.9	6.4
Aerospace products and parts	3364	985	2.5	91.1	6.4
Other transportation	other 336	1,625	D	97.4	2.4
Furniture and related products	337	12,647	0.7	r 94.5	4.8
Miscellaneous	339	20,669	0.9	93.4	5.7
Medical equipment and supplies	3391	8,060	1.9	89.9	8.2
Other miscellaneous manufacturing	3399	12,608	0.2	95.7	4.1
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	0.3	93.8	5.9
Agriculture, forestry, fishing, and hunting	11	21,606	0.0	97.7	2.3
Mining, extraction, and support activities	21	14,969	D	96.4	3.6
Utilities	22	2,684	D	95.7	4.2
Construction	23	613,110	0.1	95.3	4.6
Wholesale trade	42	257,153	0.9	93.1	6.0
Retail trade	44–45	560,952	0.3	93.1	6.6
Transportation and warehousing	48–49	152,463	0.0	92.8	7.2
Information	51	61,638	0.5	93.4	6.1
Publishing	511	17,590	0.4	94.8	4.8
Newspaper, periodical, book, and directory publishers	5111	9,761	D	96.0	3.9
Software publishers	5112	7,828	0.8	93.3	5.9
Telecommunications	517	7,164	0.2	r 88.6	11.2
Data processing, hosting, and related services	518	8,918	0.6	94.0	5.4
Other information	other 51	27,965	0.7	r 93.5	5.8
Finance and insurance	52	200,857	0.1	93.4	6.5

TABLE 120

**Companies that reported selling robotics or goods and services that included robotics, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Yes	No	Don't know
Real estate and rental and leasing	53	255,783	0.1 r	93.8	6.1
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	0.0	97.6	D
Other real estate and rental and leasing	other 53	253,970	0.1 r	93.8	6.1
Professional, scientific, and technical services	54	695,672	0.4	94.8	4.8
Legal services	5411	152,243	D	95.6	4.4
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	0.0	94.9	5.1
Architectural, engineering, and related services	5413	88,491	1.5	94.2	4.3
Specialized design services	5414	26,282	0.0	96.6	3.4
Computer systems design and related services	5415	95,950	0.8	92.8	6.4
Management, scientific, and technical consulting services	5416	132,989	0.2	95.2	4.6
Scientific research and development services	5417	9,798	1.6	92.8	5.6
Advertising, public relations, and related services	5418	27,677	0.0	96.4	3.6
Other professional, scientific, and technical services	5419	55,569	0.1 r	95.5	4.4
Management of companies and enterprises	55	2,409	0.0	94.5	5.5 r
Administrative and support and waste management and remediation services	56	287,807	0.3	94.5	5.2
Educational services	61	53,912	0.3 r	95.9	3.8
Health care and social assistance	62	519,556	0.2	94.2	5.6
Health care services	621–23	459,855	0.2	94.2	5.6
Social assistance	624	59,700	D	94.3	5.7
Arts, entertainment, and recreation	71	88,831	0.2 r	94.7	5.1
Accommodation and food services	72	453,059	0.2	91.1	8.7
Other services	81	345,125	0.2	93.1	6.7

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.

TABLE 121

**Companies that reported selling robotics or goods and services that included robotics, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	Yes	No	Don't know
All companies	4,805,151	0.3	93.8	5.9
Micro companies				
1–4	2,667,724	0.2	93.9	5.9
5–9	936,576	0.3	93.8	5.9
Small companies				
10–19	579,513	0.5	93.8	5.7
20–49	402,199	0.4	93.7	5.9
Medium companies				
50–99	119,497	0.7	93.7	5.6
100–249	65,565	1.0	93.3	5.7
Large companies				
250–499	18,897	1.6	89.7	8.7
500–999	7,289	0.9	91.7	7.4
1,000–4,999	6,199	0.9	86.8	12.3 r
5,000–9,999	823	1.7	83.0	15.3
10,000–24,999	514	3.5	71.5	24.9
25,000 or more	358	3.9	60.6	35.5 r

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.

TABLE 122

**Companies that reported selling specialized equipment or goods and services that included specialized equipment, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Yes	No	Don't know
All industries	11, 21–23, 31–33, 42–81	4,805,151	2.3	91.2	6.6
Manufacturing industries	31–33	217,565	6.4	86.7	6.9
Food	311	18,250	2.9	88.8	8.3
Beverage and tobacco products	312	7,723	1.4	92.6	6.0
Textile, apparel, and leather products	313–16	10,554	2.6	88.2	9.2
Wood products	321	11,012	2.5	91.3	6.2
Paper	322	2,117	3.2	93.1	3.7
Printing and related support activities	323	20,851	4.1	90.7	5.2
Petroleum and coal products	324	583	2.7	92.5	4.5
Chemicals	325	7,522	5.1	86.7	8.2
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	7.9	88.2	4.0
Pharmaceuticals and medicines	3254	1,365	5.6	87.7	6.7
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	3.4	90.2	6.4
Other chemicals	other 325	3,927	5.2	84.7	10.1
Plastics and rubber products	326	8,087	7.0	87.5	5.5
Nonmetallic mineral products	327	7,749	2.3	93.2	4.5
Primary metals	331	2,537	4.5	87.5	8.0
Fabricated metal products	332	48,472	6.3	87.1	6.6
Machinery	333	18,558	16.7	74.9	8.4
Computer and electronic products	334	9,036	20.1	70.3	9.6
Communications equipment	3342	974	23.4	66.2	10.6
Semiconductor and other electronic components	3344	2,796	11.4	79.0	9.6
Navigational, measuring, electromedical, and control instruments	3345	3,909	28.4	63.1	8.5
Other computer and electronic products	other 334	1,359	11.6	76.2	12.2
Electrical equipment, appliances, and components	335	4,000	10.5	80.6	8.9
Transportation equipment	336	7,175	6.9	86.0	7.1
Automobiles, bodies, trailers, and parts	3361–63	4,565	6.4	86.2	7.4
Aerospace products and parts	3364	985	11.0	81.8	7.2
Other transportation	other 336	1,625	5.7	88.1	6.2
Furniture and related products	337	12,647	2.8	91.8	5.4
Miscellaneous	339	20,669	6.6	86.9	6.6
Medical equipment and supplies	3391	8,060	7.5	83.8	8.7
Other miscellaneous manufacturing	3399	12,608	6.0	88.8	5.2
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	2.1	91.4	6.6
Agriculture, forestry, fishing, and hunting	11	21,606	0.6	95.8	3.6
Mining, extraction, and support activities	21	14,969	2.3	94.1	3.6
Utilities	22	2,684	1.9	92.7	5.4
Construction	23	613,110	1.7	92.8	5.5
Wholesale trade	42	257,153	4.8	87.9	7.3
Retail trade	44–45	560,952	1.9	90.9	7.2
Transportation and warehousing	48–49	152,463	1.3	90.9	7.8
Information	51	61,638	3.4	89.4	7.2
Publishing	511	17,590	2.1	92.0	5.9
Newspaper, periodical, book, and directory publishers	5111	9,761	0.9	94.3	4.7
Software publishers	5112	7,828	3.6	89.2	7.3
Telecommunications	517	7,164	6.2	80.8	13.0
Data processing, hosting, and related services	518	8,918	5.3	87.5	7.2
Other information	other 51	27,965	2.9	90.5	6.7

TABLE 122

**Companies that reported selling specialized equipment or goods and services that included specialized equipment, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	Yes	No	Don't know
Finance and insurance	52	200,857	0.6	92.5	6.9
Real estate and rental and leasing	53	255,783	0.6	93.0	6.4
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	0.0	97.6	D
Other real estate and rental and leasing	other 53	253,970	0.6	93.0	6.4
Professional, scientific, and technical services	54	695,672	2.6	92.1	5.3
Legal services	5411	152,243	0.6	94.9	4.5
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	0.9	93.7	5.4
Architectural, engineering, and related services	5413	88,491	6.0	88.8	5.3
Specialized design services	5414	26,282	1.5	94.7	3.7
Computer systems design and related services	5415	95,950	5.5	87.0	7.5
Management, scientific, and technical consulting services	5416	132,989	1.6	93.4	5.0
Scientific research and development services	5417	9,798	7.8	85.6	6.7
Advertising, public relations, and related services	5418	27,677	1.6	94.4	3.9
Other professional, scientific, and technical services	5419	55,569	3.4	91.6	5.0
Management of companies and enterprises	55	2,409	D	90.0	7.7
Administrative and support and waste management and remediation services	56	287,807	2.3	92.0	5.7
Educational services	61	53,912	1.3	94.4	4.3
Health care and social assistance	62	519,556	2.6	91.2	6.1
Health care services	621–23	459,855	3.0	90.8	6.2
Social assistance	624	59,700	0.0	94.2	5.8
Arts, entertainment, and recreation	71	88,831	1.5	93.0	5.5
Accommodation and food services	72	453,059	0.9	89.8	9.3
Other services	81	345,125	2.7	89.7	7.6

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.

TABLE 123

**Companies that reported selling specialized equipment or goods and services that included specialized equipment, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	Yes	No	Don't know
All companies	4,805,151	2.3	91.2	6.6
Micro companies				
1–4	2,667,724	1.7	91.9	6.4
5–9	936,576	2.7	90.6	6.7
Small companies				
10–19	579,513	3.0	90.3	6.6
20–49	402,199	3.2	90.1	6.8
Medium companies				
50–99	119,497	3.5	89.9	6.6
100–249	65,565	4.1	88.7	7.3
Large companies				
250–499	18,897	5.0	85.5	9.5
500–999	7,289	3.7 r	86.1	10.2
1,000–4,999	6,199	4.4 r	81.8	13.8 r
5,000–9,999	823	5.8	75.5	18.5
10,000–24,999	514	7.6	66.1	26.1
25,000 or more	358	7.3	56.1	36.6 r

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. 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.



TABLE 124

**Motivations for companies producing artificial intelligence or goods or services with artificial intelligence, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To upgrade goods or services	To expand the range of goods or services	To enter new markets or adapt existing products to new markets	To increase or maintain market share	To adopt standards and accreditation	Some other reason
All industries	11, 21–23, 31–33, 42–81	19,775	56.5	54.8	41.2	36.1	16.5	14.8
Manufacturing industries	31–33	817	65.7	59.1	46.8	46.4	19.3	8.0
Food	311	30 r	D	0.0	0.0	0.0	0.0	D
Beverage and tobacco products	312	0	0.0	0.0	0.0	0.0	0.0	0.0
Textile, apparel, and leather products	313–16	11	D	D	0.0	D	D	0.0
Wood products	321	3	100.0	0.0	0.0	D	0.0	0.0
Paper	322	D	D	D	D	D	0.0	0.0
Printing and related support activities	323	56	78.6	80.4	39.3 r	67.9	D	0.0
Petroleum and coal products	324	0	0.0	0.0	0.0	0.0	0.0	0.0
Chemicals	325	25 r	D	D	D	D	0.0	D
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	0	0.0	0.0	0.0	0.0	0.0	0.0
Pharmaceuticals and medicines	3254	D	D	D	D	0.0	0.0	0.0
Soap, cleaning compound, and toilet preparation manufacturing	3256	D	D	D	D	D	0.0	0.0
Other chemicals	other 325	D	0.0	0.0	0.0	0.0	0.0	D
Plastics and rubber products	326	9	88.9 r	D	D	66.7	D	0.0
Nonmetallic mineral products	327	D	D	D	0.0	0.0	D	0.0
Primary metals	331	0	0.0	0.0	0.0	0.0	0.0	0.0
Fabricated metal products	332	153	63.4 r	58.8 r	56.9 r	90.2	D	D
Machinery	333	231	63.6	58.9	37.7 r	33.3 r	22.9 r	D
Computer and electronic products	334	145	56.6	67.6	65.5	50.3	D	4.1
Communications equipment	3342	9	111.1	D	D	D	0.0	D
Semiconductor and other electronic components	3344	10	0.0	D	30.0	D	0.0	D
Navigational, measuring, electromedical, and control instruments	3345	93	59.1	75.3	78.5	63.4	D	D
Other computer and electronic products	other 334	30	60.0 r	73.3	46.7 r	23.3 r	0.0	0.0
Electrical equipment, appliances, and components	335	80	87.5	60.0 r	56.3 r	16.3 r	0.0	11.3
Transportation equipment	336	17	64.7 r	82.4 r	76.5 r	76.5 r	D	35.3
Automobiles, bodies, trailers, and parts	3361–63	11	72.7 r	54.5 r	54.5 r	54.5 r	D	D
Aerospace products and parts	3364	D	D	D	D	D	0.0	D
Other transportation	other 336	D	D	D	D	D	0.0	0.0
Furniture and related products	337	9 r	D	D	D	0.0	0.0	0.0
Miscellaneous	339	46	80.4	73.9	56.5 r	50.0 r	47.8 r	0.0
Medical equipment and supplies	3391	38	84.2	73.7	63.2 r	50.0 r	55.3 r	0.0
Other miscellaneous manufacturing	3399	6 r	D	D	D	D	D	0.0
Nonmanufacturing industries	11, 21–23, 42–81	18,959	56.1	54.6	41.0	35.7	16.4	15.1
Agriculture, forestry, fishing, and hunting	11	0	0.0	0.0	0.0	0.0	0.0	0.0
Mining, extraction, and support activities	21	D	0.0	D	D	0.0	0.0	0.0
Utilities	22	5	D	D	D	D	D	D
Construction	23	1,146	53.8	47.8	22.4	20.1	D	20.9
Wholesale trade	42	1,322	61.6	69.4	47.7	43.7	16.0	4.9

TABLE 124

**Motivations for companies producing artificial intelligence or goods or services with artificial intelligence, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To upgrade goods or services	To expand the range of goods or services	To enter new markets or adapt existing products to new markets	To increase or maintain market share	To adopt standards and accreditation	Some other reason
Retail trade	44–45	1,818	58.7	38.4	35.6	40.1	15.6	7.9 r
Transportation and warehousing	48–49	92 r	73.9	10.9 r	31.5	12.0 r	D	52.2
Information	51	1,301	58.6	66.3	53.3	59.3	14.3	11.2
Publishing	511	428	57.7	59.1	62.9	60.7	17.3	9.1 r
Newspaper, periodical, book, and directory publishers	5111	22	36.4 r	36.4 r	36.4 r	40.9 r	D	68.2
Software publishers	5112	407	58.2	59.7	63.6	61.4	16.7	6.1 r
Telecommunications	517	170	27.6 r	51.2 r	35.9 r	45.9 r	D	40.0 r
Data processing, hosting, and related services	518	521	65.8	77.0	47.2	59.7	17.9	5.0
Other information	other 51	180	68.9	67.2	63.9	67.2	8.3 r	7.2
Finance and insurance	52	780	57.2	28.8	24.7	57.6	28.7	10.3 r
Real estate and rental and leasing	53	295	47.8 r	62.4	47.8 r	52.5 r	52.2	0.0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0.0	0.0	0.0	0.0	0.0	0.0
Other real estate and rental and leasing	other 53	295	47.8 r	62.4	47.8 r	52.5 r	52.2	0.0
Professional, scientific, and technical services	54	8,045	55.3	61.4	45.3	34.3	11.8	15.0 r
Legal services	5411	425	43.1 r	41.6	31.8	41.2 r	9.6 r	30.8 r
Accounting, tax preparation, bookkeeping, and payroll services	5412	449	79.1	34.7	29.2 r	30.5 r	17.4 r	D
Architectural, engineering, and related services	5413	598	67.6	57.9	46.8	43.5	6.7 r	20.6
Specialized design services	5414	148	D	D	D	0.0	D	D
Computer systems design and related services	5415	4,470	56.4	67.7	48.3	33.4	14.5	12.9
Management, scientific, and technical consulting services	5416	1,184	49.2	54.6	38.9	28.0	2.0 r	13.5
Scientific research and development services	5417	274	50.4	65.3	56.9	28.5	4.7	13.5
Advertising, public relations, and related services	5418	182	33.5	79.1	45.6	33.0	19.2 r	7.7
Other professional, scientific, and technical services	5419	320	52.2	71.9	63.1	71.6	D	D
Management of companies and enterprises	55	D	0.0	0.0	D	0.0	0.0	0.0
Administrative and support and waste management and remediation services	56	959	57.9	58.5	41.6	32.8	18.5	17.8
Educational services	61	88 r	D	100.0	D	51.1 r	0.0	D
Health care and social assistance	62	1,570	67.6	47.4	32.9	27.7	26.4	26.8
Health care services	621–23	1,570	67.6	47.4	32.9	27.7	26.4	26.8
Social assistance	624	0	0.0	0.0	0.0	0.0	0.0	0.0
Arts, entertainment, and recreation	71	D	D	D	D	D	D	0.0
Accommodation and food services	72	749	35.8 r	28.7 r	30.4	D	29.6	21.6
Other services	81	637	53.1	39.2	36.4	19.0 r	17.4 r	22.1 r

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

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. 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.

TABLE 125

**Impact of producing artificial intelligence or goods or services with artificial intelligence 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	19,775	23.3	4.1	72.6	44.3	2.1	53.6	39.4	1.8	40.7	18.1
Manufacturing industries	31–33	817	37.1	6.0	56.9	48.9	0.9	50.2	46.4	D	37.9	15.2
Food	311	30	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0
Beverage and tobacco products	312	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Textile, apparel, and leather products	313–16	11	D	0.0	D	D	0.0	D	D	0.0	0.0	D
Wood products	321	3	D	0.0	D	0.0	0.0	100.0	0.0	0.0	D	D
Paper	322	D	D	0.0	0.0	D	0.0	0.0	D	0.0	0.0	0.0
Printing and related support activities	323	56	16.1	D	78.6	22.8	0.0	77.2	19.6	0.0	D	60.7
Petroleum and coal products	324	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chemicals	325	25	D	D	D	D	0.0	92.0	D	0.0	D	D
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pharmaceuticals and medicines	3254	D	D	0.0	0.0	0.0	0.0	D	0.0	0.0	D	0.0
Soap, cleaning compound, and toilet preparation manufacturing	3256	D	D	0.0	0.0	D	0.0	0.0	D	0.0	0.0	0.0
Other chemicals	other 325	D	0.0	D	D	0.0	0.0	D	0.0	0.0	D	D
Plastics and rubber products	326	9	D	D	D	88.9	0.0	D	D	0.0	D	D
Nonmetallic mineral products	327	D	D	D	0.0	D	0.0	D	D	0.0	D	0.0
Primary metals	331	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fabricated metal products	332	153	40.4	18.5	41.0	60.8	D	38.6	60.8	0.0	37.3	D
Machinery	333	231	56.7	D	42.4	42.2	0.0	57.8	36.4	0.0	58.0	5.6
Computer and electronic products	334	145	44.1	3.5	52.5	68.3	D	27.6	69.0	D	19.3	9.0
Communications equipment	3342	9	D	0.0	55.6	D	0.0	55.6	77.8	0.0	D	0.0
Semiconductor and other electronic components	3344	10	D	0.0	60.0	0.0	0.0	100.0	D	0.0	50.0	D
Navigational, measuring, electromedical, and control instruments	3345	93	41.3	5.5	53.2	77.4	D	18.3	75.3	D	15.1	D
Other computer and electronic products	other 334	30	54.8	0.0	45.2	77.4	0.0	22.6	73.3	0.0	23.3	D
Electrical equipment, appliances, and components	335	80	D	0.0	91.3	59.2	0.0	40.8	59.2	0.0	32.1	8.7
Transportation equipment	336	17	23.5	D	64.7	33.3	0.0	66.7	42.1	0.0	57.9	0.0
Automobiles, bodies, trailers, and parts	3361–63	11	D	D	54.5	D	0.0	72.7	D	0.0	72.7	0.0
Aerospace products and parts	3364	D	0.0	0.0	D	D	0.0	D	D	0.0	D	0.0
Other transportation	other 336	D	D	0.0	D	0.0	0.0	D	D	0.0	D	0.0
Furniture and related products	337	9	D	0.0	D	100.0	0.0	0.0	D	0.0	D	0.0

TABLE 125

**Impact of producing artificial intelligence or goods or services with artificial intelligence 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	46	15.2	r	0.0	84.8	54.3	r	0.0	45.7	r	60.9	0.0	23.9	r	D			
Medical equipment and supplies	3391	38	D		0.0	97.4	53.8	r	0.0	46.2	r	63.2	r	0.0	21.1	r	D		
Other miscellaneous manufacturing	3399	6	r	D	0.0	D	D		0.0	D		D		0.0	D		0.0		
Nonmanufacturing industries	11, 21–23, 42–81	18,959	22.7		4.0	73.3	44.1		2.1	53.8		39.2	1.9	40.8		18.2			
Agriculture, forestry, fishing, and hunting	11	0	0.0		0.0	0.0	0.0		0.0	0.0		0.0		0.0		0.0			
Mining, extraction, and support activities	21	D	0.0		0.0	D	0.0		0.0	D		0.0		0.0		D			
Utilities	22	5	D		0.0	D	D		0.0	D		D		0.0		D			
Construction	23	1,146	32.5		D	63.5	47.8		D	48.3		45.5		D	32.6	18.1			
Wholesale trade	42	1,322	11.3		3.6	r	85.1		30.3	D		68.2		18.2	D	62.9	18.8		
Retail trade	44–45	1,818	21.7		0.0	78.3	40.2		D	56.9		23.0		0.0	51.2	25.8			
Transportation and warehousing	48–49	92	r	31.5		D	45.7	r	55.4		D	43.5	29.7	r	0.0	30.8	39.6	r	
Information	51	1,301	32.7		2.5	r	64.8		50.5		D	49.3	51.0		D	35.6	13.0		
Publishing	511	428	33.4		2.8	r	63.8		55.0		0.0	45.0	55.4		D	37.6	6.5	r	
Newspaper, periodical, book, and directory publishers	5111	22	D		D		50.0	r	54.5	r	0.0	45.5	r	D	0.0	D	31.8	r	
Software publishers	5112	407	33.4		1.7		64.9		54.9		0.0	45.1	56.5		D	38.1	4.7	r	
Telecommunications	517	170	11.2	r	D		80.6		25.3		D	73.5	12.4		D	42.4	r	43.5	r
Data processing, hosting, and related services	518	521	33.8		D		65.1		52.0		0.0	48.0	59.0		0.0	31.2	9.8	r	
Other information	other 51	180	48.6		0.0		51.4		59.8		0.0	40.2	53.6		0.0	36.9	9.5	r	
Finance and insurance	52	780	24.4		20.6		55.0		40.8		D	48.1	35.8		D	38.3	19.6		
Real estate and rental and leasing	53	295	D		0.0	100.0	33.2		0.0	66.8		33.2	0.0		D	D			
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0			
Other real estate and rental and leasing	other 53	295	D		0.0	100.0	33.2		0.0	66.8		33.2	0.0		D	D			
Professional, scientific, and technical services	54	8,045	22.8		1.9	r	75.3		48.9		0.2	50.9	46.6		0.1	r	40.3	13.1	
Legal services	5411	425	0.0		D		86.4		32.8		0.0	67.2	15.8	r	0.0	28.0	r	56.2	r
Accounting, tax preparation, bookkeeping, and payroll services	5412	449	17.8	r	D		81.5		27.5		0.0	72.5	27.4		0.0	45.0	27.6	r	
Architectural, engineering, and related services	5413	598	27.6	r	D		70.9		43.1		D	55.5	43.3		D	48.0	8.7	r	
Specialized design services	5414	148	0.0		0.0	100.0	D		0.0	73.0		D	0.0		D	D			
Computer systems design and related services	5415	4,470	22.7		1.6	r	75.7		51.3		0.1	r	48.6	48.8		D	43.5	7.5	
Management, scientific, and technical consulting services	5416	1,184	32.7		D		66.9		53.7		0.0	46.3	55.5		0.0	36.7	7.8		
Scientific research and development services	5417	274	47.8		D		51.1		62.2		0.0	37.8	65.2		0.0	28.6	6.2	r	
Advertising, public relations, and related services	5418	182	7.7		D		92.3		29.7		D	68.1	16.5		0.0	51.6	31.9		
Other professional, scientific, and technical services	5419	320	12.5	r	0.0		87.5		73.5		0.0	26.5	r	67.1	0.0	12.5	r	20.4	r

TABLE 125

**Impact of producing artificial intelligence or goods or services with artificial intelligence 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	D	D	0.0	0.0	D	0.0	0.0	D	0.0	0.0	0.0	0.0
Administrative and support and waste management and remediation services	56	959	19.2	13.5	r 67.3	47.7	0.0	52.3	54.6	D	31.7	D	
Educational services	61	88	r 0.0	D	97.7	0.0	0.0	100.0	0.0	0.0	100.0	0.0	
Health care and social assistance	62	1,570	26.6	D	69.8	35.7	D	60.8	27.7	D	41.8	24.3	
Health care services	621–23	1,570	26.6	D	69.8	35.7	D	60.8	27.7	D	41.8	24.3	
Social assistance	624	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Arts, entertainment, and recreation	71	D	0.0	0.0	D	0.0	0.0	D	0.0	0.0	D	D	
Accommodation and food services	72	749	27.9	D	56.6	34.8	D	49.8	34.8	D	15.0	r 42.7	
Other services	81	637	D	0.0	92.5	45.5	0.0	54.5	25.0	0.0	39.9	35.2	

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



TABLE 126

**Impact of producing artificial intelligence or goods or services with artificial intelligence 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								
Fabricated metal products	332	153	43.8	r	D	38.6	r	D	D	D	96.7	D	D	D	96.7	D	D	0.0	62.7	r	D					
Machinery	333	231	34.2	r	0.0	60.6	5.2	r	26.5	r	0.0	68.3	5.2	r	9.1	r	0.0	87.4	D	24.2	r	0.0	72.3	D		
Computer and electronic products	334	145	23.4	r	D	66.9	6.9	r	27.6	r	D	62.1	5.5	r	18.6	r	D	68.3	D	20.7	r	D	64.1	9.0	r	
Communications equipment	3342	9	D		0.0	88.9	0.0		D		0.0	88.9	0.0		0.0		0.0	100.0	0.0	0.0		0.0	100.0	0.0		
Semiconductor and other electronic components	3344	10	0.0		0.0	100.0	r	D	0.0		0.0	100.0	r	D	D		0.0	90.0	r	0.0		0.0	90.0	r	D	
Navigational, measuring, electromedical, and control instruments	3345	93	34.4	r	D	54.8	r	D	37.6	r	D	51.6	r	D	23.7	r	D	55.9	r	D	28.0	r	D	51.6	r	D
Other computer and electronic products	other 334	30	0.0		0.0	96.7	D		D		0.0	83.3	D		D		0.0	96.7	0.0	16.2		0.0	83.8	0.0		
Electrical equipment, appliances, and components	335	80	D		0.0	85.0	D		10.0	r	0.0	83.8	D		D		0.0	81.3	8.8	r	D		0.0	81.3	8.8	r
Transportation equipment	336	17	D		D	76.5	r	D	D		0.0	82.4	r	D	D		0.0	70.6	D	D		0.0	76.5	r	D	
Automobiles, bodies, trailers, and parts	3361–63	11	D		D	54.5	r	D	D		0.0	72.7	r	D	D		0.0	54.5	D	D		0.0	72.7	r	D	
Aerospace products and parts	3364	D	0.0		0.0	D		0.0	0.0		0.0	D		0.0		0.0	D	0.0	0.0		0.0	D	0.0	0.0		
Other transportation	other 336	D	0.0		0.0	D		0.0	0.0		0.0	D		0.0		0.0	D	0.0	D		0.0	D	0.0	0.0		
Furniture and related products	337	9	r	D	D	D		0.0	D		0.0	D		0.0		0.0	100.0	r	0.0		D		0.0	D	0.0	
Miscellaneous	339	46	15.2	r	0.0	71.7	D		D		0.0	52.2	r	D	D		D	87.0	D	D		D	52.2	r	D	
Medical equipment and supplies	3391	38	D		0.0	78.9	D		D		0.0	47.4	r	D	D		0.0	89.5	D	D		0.0	47.4	r	D	
Other miscellaneous manufacturing	3399	6	r	D	0.0	D		0.0	D		0.0	D		0.0		D	D	0.0	0.0		D		D	0.0		





TABLE 126

**Impact of producing artificial intelligence or goods or services with artificial intelligence 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	
Other real estate and rental and leasing	other 53	295	D	0.0	47.8	r D	D	0.0	67.1	D	D	0.0	100.0	0.0	D	0.0	62.0	D	
Professional, scientific, and technical services	54	8,045	12.8	0.9	r 50.9	35.4	9.5	1.3	r 63.2	26.0	7.3	0.5	67.2	25.0	10.6	1.3	r 63.1	25.0	
Legal services	5411	425	0.0	0.0	21.0	r 79.0	0.0	D	38.8	47.5	D	0.0	37.2	49.2	0.0	D	30.1	r 56.2	r
Accounting, tax preparation, bookkeeping, and payroll services	5412	449	D	0.0	61.9	29.2	r 8.7	r D	54.6	36.1	D	0.0	70.8	28.3	17.1	r D	57.2	24.9	r
Architectural, engineering, and related services	5413	598	5.7	r D	63.7	30.4	11.5	r D	70.7	16.1	r 2.0	r D	82.9	14.7	3.5	D	79.4	16.7	r
Specialized design services	5414	148	0.0	0.0	74.3	D	0.0	0.0	49.3	r D	0.0	0.0	49.3	r D	0.0	0.0	49.3	r D	
Computer systems design and related services	5415	4,470	15.0	1.3	r 52.0	31.7	10.6	0.5	65.9	23.0	6.4	0.6	r 71.8	21.2	10.8	0.7	r 68.0	20.5	
Management, scientific, and technical consulting services	5416	1,184	15.5	r D	47.7	36.4	7.6	r D	68.2	23.8	10.8	r D	56.8	32.0	11.4	r D	56.8	31.3	
Scientific research and development services	5417	274	23.0	r D	35.8	40.1	18.2	D	47.1	33.6	24.1	r D	56.6	17.5	33.2	D	49.6	16.4	
Advertising, public relations, and related services	5418	182	4.9	D	44.5	49.5	6.0	r D	71.4	20.9	r 6.0	r D	61.0	31.9	6.0	r D	73.1	19.8	r
Other professional, scientific, and technical services	5419	320	11.6	r 0.0	50.8	37.6	9.4	r D	53.1	36.6	9.1	r D	64.4	25.0	r 9.7	r 0.0	53.3	37.0	
Management of companies and enterprises	55	D	D	0.0	0.0	0.0	0.0	0.0	D	0.0	0.0	0.0	D	0.0	0.0	0.0	D	0.0	
Administrative and support and waste management and remediation services	56	959	13.9	r 8.6	r 51.9	25.6	10.4	r D	70.3	10.9	r 4.7	r D	71.7	15.1	r 19.3	r D	57.2	15.0	r

TABLE 126

**Impact of producing artificial intelligence or goods or services with artificial intelligence 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					
Educational services	61	88	r	0.0	0.0	51.1	r	D	0.0	0.0	51.1	r	D	0.0	0.0	51.1	r	D	0.0	0.0	51.1	r	D
Health care and social assistance	62	1,570		22.0	6.4	r	48.9	22.8	26.6	8.8	r	46.2	18.4	22.0	D	48.3	23.6	17.1	D	53.2	23.5		
Health care services	621–23	1,570		22.0	6.4	r	48.9	22.8	26.6	8.8	r	46.2	18.4	22.0	D	48.3	23.6	17.1	D	53.2	23.5		
Social assistance	624	0		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arts, entertainment, and recreation	71	D		0.0	0.0		D	D	0.0	0.0		D	D	0.0	0.0	D	0.0	0.0	0.0	0.0	D	D	
Accommodation and food services	72	749		34.8	D		29.4	28.3	27.9	D		30.4	35.0	27.9	D	28.4	r	28.3	27.9	D	36.2	28.3	
Other services	81	637		0.0	0.0		54.9	45.1	D	0.0		62.0	37.5	D	0.0	54.9	44.7	D	0.0	62.0	37.5		

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.

TABLE 127

**Motivations for companies producing cloud-based computing systems and applications or goods or services with cloud-based computing systems and applications, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To upgrade goods or services		To expand the range of goods or services		To enter new markets or adapt existing products to new markets		To increase or maintain market share		To adopt standards and accreditation		Some other reason
All industries	11, 21–23, 31–33, 42–81	152,252	50.7		42.6		27.3		30.5		18.4		21.5
Manufacturing industries	31–33	3,553	50.8		41.6		25.6		31.9		12.8		26.0
Food	311	241	51.9		30.7	r	10.8		6.6		3.7	r	27.4
Beverage and tobacco products	312	74	28.4		10.8	r	9.5	r	24.3	r	37.8	r	35.1
Textile, apparel, and leather products	313–16	136	86.8		24.3		27.2		25.0	r	11.0	r	11.8
Wood products	321	99	68.7	r	67.7	r	D		19.2	r	21.2		20.2
Paper	322	6	83.3		D		D		D		0.0		D
Printing and related support activities	323	603	45.6		34.7		21.2		28.0		8.8		26.9
Petroleum and coal products	324	0	0.0		0.0		0.0		0.0		0.0		0.0
Chemicals	325	173	27.7		39.3	r	16.2		33.5	r	34.7	r	32.9
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	48	D	r	D		0.0		D		D		D
Pharmaceuticals and medicines	3254	18	83.3	r	27.8		27.8		D		27.8		0.0
Soap, cleaning compound, and toilet preparation manufacturing	3256	26	D		38.5	r	38.5	r	30.8	r	26.9	r	D
Other chemicals	other 325	80	28.8	r	10.0		13.8		8.8	r	D		62.5
Plastics and rubber products	326	118	60.2	r	12.7	r	D		18.6	r	D		22.9
Nonmetallic mineral products	327	85	56.5		18.8	r	20.0	r	35.3	r	14.1	r	23.5
Primary metals	331	5	D		0.0		0.0		0.0		D		D
Fabricated metal products	332	290	26.6		30.0	r	26.2	r	33.1	r	7.6	r	44.5
Machinery	333	298	65.4		67.1		61.1		61.4		31.2	r	34.2
Computer and electronic products	334	527	48.4		59.4		41.9		43.6		15.4	r	15.2
Communications equipment	3342	111	58.6		74.8		55.0		59.5		D		10.8
Semiconductor and other electronic components	3344	38	34.2	r	65.8		47.4	r	31.6	r	D		15.8
Navigational, measuring, electromedical, and control instruments	3345	225	40.9		56.0		38.7		42.2		17.3	r	16.9
Other computer and electronic products	other 334	154	55.8		50.6		36.4		37.7		17.5	r	14.9
Electrical equipment, appliances, and components	335	114	86.0		47.4		27.2		43.0		6.1	r	4.4
Transportation equipment	336	99	54.5		36.4	r	14.1		30.3		19.2		21.2
Automobiles, bodies, trailers, and parts	3361–63	65	64.6	r	46.2	r	21.5		26.2		15.4		12.3
Aerospace products and parts	3364	17	D		D		0.0		D		D		52.9
Other transportation	other 336	18	50.0	r	D		0.0		61.1	r	33.3	r	D
Furniture and related products	337	125	43.2		45.6	r	29.6	r	18.4	r	6.4	r	24.0
Miscellaneous	339	561	52.2		43.5		15.3		26.7	r	3.6	r	28.7
Medical equipment and supplies	3391	238	53.4		42.4	r	17.6		27.7		D		16.8
Other miscellaneous manufacturing	3399	324	51.2		43.8		13.9		25.9	r	D		37.7
Nonmanufacturing industries	11, 21–23, 42–81	148,700	50.7		42.6		27.3		30.4		18.5		21.4
Agriculture, forestry, fishing, and hunting	11	204	D		0.0		0.0		D		0.0		D
Mining, extraction, and support activities	21	40	35.0	r	17.5	r	17.5	r	25.0	r	D		D
Utilities	22	14	78.6	r	100.0		78.6		D		0.0		0.0
Construction	23	7,818	50.0		35.6		17.7		14.7		13.5		29.5

TABLE 127

**Motivations for companies producing cloud-based computing systems and applications or goods or services with cloud-based computing systems and applications, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To upgrade goods or services	To expand the range of goods or services	To enter new markets or adapt existing products to new markets	To increase or maintain market share	To adopt standards and accreditation	Some other reason
Wholesale trade	42	7,828	48.3	36.7	28.9	31.5	10.8	22.9
Retail trade	44–45	10,439	48.7	31.6	26.6	24.1	15.9	22.9
Transportation and warehousing	48–49	2,155	51.6	24.4	25.8	22.0	17.9	25.3
Information	51	10,288	52.7	59.0	44.4	50.3	16.3	13.1
Publishing	511	3,934	53.5	60.7	49.7	53.8	16.8	9.4
Newspaper, periodical, book, and directory publishers	5111	315	69.5	45.4	29.8	28.3	9.5	r 13.3
Software publishers	5112	3,618	52.0	62.0	51.4	56.1	17.4	9.0
Telecommunications	517	1,243	43.3	50.3	35.8	37.2	10.2	21.6
Data processing, hosting, and related services	518	3,829	49.3	60.0	44.2	55.4	16.7	13.8
Other information	other 51	1,282	69.7	59.2	37.0	36.2	19.3	14.4
Finance and insurance	52	8,355	51.3	32.8	21.5	33.3	18.7	28.5
Real estate and rental and leasing	53	5,069	52.2	23.4	12.6	28.9	9.5	25.6
Lessors of nonfinancial intangible assets (except copyrighted works)	533	D	0.0	0.0	0.0	0.0	0.0	D
Other real estate and rental and leasing	other 53	5,068	52.2	23.4	12.6	28.9	9.5	25.6
Professional, scientific, and technical services	54	60,394	52.5	53.9	34.0	36.9	18.4	15.2
Legal services	5411	4,086	52.5	19.3	8.7	21.5	9.7	28.2
Accounting, tax preparation, bookkeeping, and payroll services	5412	7,179	50.2	45.2	24.2	30.7	19.0	18.2
Architectural, engineering, and related services	5413	4,304	49.0	43.4	20.8	20.9	19.3	18.8
Specialized design services	5414	1,106	45.8	47.4	20.4	26.4	14.4	r 31.9
Computer systems design and related services	5415	31,736	55.6	63.9	42.3	41.6	19.1	11.4
Management, scientific, and technical consulting services	5416	8,132	45.1	51.5	32.9	43.1	21.9	13.5
Scientific research and development services	5417	548	44.2	54.2	56.9	33.0	17.2	13.1
Advertising, public relations, and related services	5418	1,556	50.3	46.0	31.1	37.6	16.3	21.8
Other professional, scientific, and technical services	5419	1,751	59.6	37.2	23.2	29.4	9.1	25.4
Management of companies and enterprises	55	55	r D	D	0.0	D	0.0	D
Administrative and support and waste management and remediation services	56	6,923	52.3	44.7	29.0	30.6	20.0	27.5
Educational services	61	2,242	48.6	48.4	30.6	33.9	19.6	33.7
Health care and social assistance	62	14,288	44.0	27.3	9.8	12.7	36.7	27.8
Health care services	621–23	13,152	44.0	27.3	9.3	11.3	38.1	27.3
Social assistance	624	1,136	44.1	26.9	14.9	29.2	20.3	32.7
Arts, entertainment, and recreation	71	1,183	34.2	34.1	16.5	r 15.6	r 11.7	36.1
Accommodation and food services	72	5,872	47.3	14.2	10.6	14.8	18.5	34.4
Other services	81	5,527	56.5	35.4	22.1	19.4	8.8	24.4

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. Detail may exceed total because companies could select more than one response. 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.

**TABLE 128**  
**Impact of producing cloud-based computing systems and applications or goods or services with cloud-based computing systems and applications 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	152,252	16.3	3.6	80.1	31.6	1.3	67.1	23.8	0.8	44.3	31.1							
Manufacturing industries	31–33	3,553	19.5	7.2	73.3	32.6	1.6	65.8	26.6	1.7	47.1	24.7							
Food	311	241	14.5	r	D	70.1	19.9	r	D	64.7	13.7	r	D	49.4	21.6				
Beverage and tobacco products	312	74	14.9	r	D	79.7	31.1		D	63.5	18.9		D	58.1	16.2				
Textile, apparel, and leather products	313–16	136	16.2	r	D	78.7	26.5		D	69.1	16.2	r	D	26.5	52.2				
Wood products	321	99	r	20.2	r	D	33.3	r	17.4	r	0.0	82.6	22.4	0.0	56.2	r	21.4	r	
Paper	322	6		D		0.0	83.3		D		0.0	83.3		D		0.0	83.3		0.0
Printing and related support activities	323	603	17.5	r	6.0	76.5	30.5		D	69.5	19.1	r	D	47.8	33.1				
Petroleum and coal products	324	0	0.0		0.0	0.0	0.0		0.0		0.0		0.0	0.0	0.0				
Chemicals	325	173	13.3	r	D	83.2	8.1		0.0	91.9	10.6	r	0.0	81.2	8.2	r			
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	48	r	0.0		0.0	100.0		0.0	0.0	100.0		0.0	100.0	0.0				
Pharmaceuticals and medicines	3254	18	35.3		0.0	64.7	r	D	0.0	83.3	r	57.9	r	0.0	42.1	0.0			
Soap, cleaning compound, and toilet preparation manufacturing	3256	26	0.0		0.0	100.0		D	0.0	88.5		D		0.0	42.3	46.2			
Other chemicals	other 325	80	22.5	r	D	71.3	8.9		0.0	91.1	8.8		0.0	87.5	D				
Plastics and rubber products	326	118	r	9.3	r	D	88.1	16.0	r	0.0	84.0	9.3	r	D	79.7	D			
Nonmetallic mineral products	327	85	18.6		9.3	r	72.1	16.5		D	83.5	9.2	r	0.0	42.5	48.3			
Primary metals	331	5	80.0		0.0	D	80.0		0.0	D	D		0.0	D	0.0				
Fabricated metal products	332	290	24.5	r	D	75.2	41.2	r	0.0	58.8	30.7	r	0.0	31.7	r	37.6	r		
Machinery	333	298	33.6	r	D	66.4	56.5		D	43.5	57.9		D	19.0	r	23.1	r		
Computer and electronic products	334	527	24.3		3.6	72.1	37.0		D	61.9	34.7		D	55.0	8.5				
Communications equipment	3342	111	19.8		D	78.4	25.4		0.0	74.6	22.7		0.0	65.5	11.8	r			
Semiconductor and other electronic components	3344	38		D	23.7	r	76.3	16.2	r	0.0	83.8		D	D	68.4	D			
Navigational, measuring, electromedical, and control instruments	3345	225	23.3		3.1	r	73.6	41.3		D	56.9	39.6		D	51.6	7.1	r		
Other computer and electronic products	other 334	154	35.1		D	64.3	43.8		0.0	56.2	43.2		0.0	49.7	7.1				
Electrical equipment, appliances, and components	335	114	41.2		0.0	58.8	62.9		0.0	37.1	59.6		0.0	36.8	D				
Transportation equipment	336	99	11.1		D	83.8	33.3	r	D	62.6	38.4	r	D	45.5	14.1	r			
Automobiles, bodies, trailers, and parts	3361–63	65	13.8	r	D	76.9	44.6	r	D	49.2	r	49.2	r	D	41.5	r	D		
Aerospace products and parts	3364	17	0.0		0.0	100.0	0.0		0.0	100.0	0.0		0.0	82.4	D				
Other transportation	other 336	18		D		0.0	100.0		D	0.0	72.2	r	D	0.0	27.8	r	44.4	r	
Furniture and related products	337	125	3.2	r	13.6	r	83.2	17.6	r	D	82.4	13.5	r	D	57.1	29.4			

**TABLE 128**  
**Impact of producing cloud-based computing systems and applications or goods or services with cloud-based computing systems and applications 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	561	14.3	r	12.3	r	73.5	33.4	r	0.0	66.6	22.4	r	0.0	46.1	31.5
Medical equipment and supplies	3391	238	5.9		D		85.3	26.4	r	0.0	73.6	26.3	r	0.0	37.9	35.8
Other miscellaneous manufacturing	3399	324	20.7	r	D		64.5	38.8	r	0.0	61.2	19.8	r	0.0	51.5	28.7
Nonmanufacturing industries	11, 21–23, 42–81	148,700	16.2		3.5		80.3	31.6		1.2	67.2	23.8		0.8	44.2	31.3
Agriculture, forestry, fishing, and hunting	11	204	0.0		0.0		100.0	0.0		0.0	100.0	0.0		0.0	60.8	D
Mining, extraction, and support activities	21	40	0.0		0.0		100.0	23.1	r	0.0	76.9	23.7	r	0.0	63.2	13.2
Utilities	22	14	38.5	r	0.0		61.5	r	71.4	r	0.0	D		0.0	D	D
Construction	23	7,818	15.0		5.2		79.8	28.6		1.7	r	69.7	21.8		D	41.1
Wholesale trade	42	7,828	12.8		5.1		82.1	28.7		D		70.6	20.0	0.7	r	49.8
Retail trade	44–45	10,439	12.7		6.3		81.0	19.8		4.5		75.7	16.4	2.4		37.5
Transportation and warehousing	48–49	2,155	23.3		3.1	r	73.6	29.5		1.3	r	69.2	13.2	0.0		40.5
Information	51	10,288	25.5		3.3		71.2	40.4		0.5		59.1	36.1	0.7	r	45.2
Publishing	511	3,934	27.1		1.8		71.1	45.0		0.5	r	54.5	38.7	0.2	r	48.7
Newspaper, periodical, book, and directory publishers	5111	315	13.7		5.7		80.5	39.0		D		60.3	18.4		D	47.9
Software publishers	5112	3,618	28.2		1.4		70.4	45.6		0.5	r	53.9	40.4		D	48.8
Telecommunications	517	1,243	20.6		7.2		72.2	31.1		0.7	r	68.2	24.4	3.1	r	38.4
Data processing, hosting, and related services	518	3,829	27.5		3.3		69.2	40.7		0.7	r	58.6	39.4	0.6	r	44.1
Other information	other 51	1,282	19.8		4.1		76.1	34.5		D		65.4	30.1		D	44.5
Finance and insurance	52	8,355	20.0		2.6		77.4	33.8		D		65.4	19.7		D	39.9
Real estate and rental and leasing	53	5,069	10.9		3.7		85.4	20.9		D		78.2	9.3	0.0		45.7
Lessors of nonfinancial intangible assets (except copyrighted works)	533	D	0.0		0.0		D	0.0		0.0		D	0.0		0.0	0.0
Other real estate and rental and leasing	other 53	5,068	10.9		3.7		85.4	20.9		D		78.2	9.3	0.0		45.6
Professional, scientific, and technical services	54	60,394	16.7		2.6		80.7	36.5		0.6		62.9	29.9	0.5		47.4
Legal services	5411	4,086	11.2		6.8		82.0	25.1		D		72.8	13.2	0.0		29.1
Accounting, tax preparation, bookkeeping, and payroll services	5412	7,179	16.2		2.7		81.1	29.3		1.0	r	69.7	16.2	1.1	r	54.5
Architectural, engineering, and related services	5413	4,304	14.1		1.5		84.4	29.9		0.9	r	69.2	29.0	0.9	r	56.9
Specialized design services	5414	1,106	9.4	r	7.9	r	82.7	25.9		D		73.9	20.2	0.0		43.5
Computer systems design and related services	5415	31,736	17.4		1.9		80.7	39.9		0.4		59.7	34.9	0.5		48.7
Management, scientific, and technical consulting services	5416	8,132	19.7		1.5		78.8	41.0		D		58.5	33.0		D	41.5
Scientific research and development services	5417	548	25.5		1.6	r	72.9	45.6		0.0		54.4	43.0	0.0		49.4
Advertising, public relations, and related services	5418	1,556	14.4		7.6	r	78.0	34.2		1.1		64.7	26.3	0.6	r	42.1
Other professional, scientific, and technical services	5419	1,751	14.6		D		81.4	31.8		0.0		68.2	26.7	0.0		49.1



**TABLE 128**  
**Impact of producing cloud-based computing systems and applications or goods or services with cloud-based computing systems and applications 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	55 r	0.0	0.0	100.0	0.0	0.0	100.0	0.0	0.0		D	D
Administrative and support and waste management and remediation services	56	6,923	17.4	3.3	79.3	28.9	D	70.5	18.8	D		40.6	40.0
Educational services	61	2,242	26.6	5.7 r	67.7	41.2	D	57.0	27.2	0.0		34.4	38.4
Health care and social assistance	62	14,288	15.2	3.0	81.8	28.4	1.0	70.6	17.9	1.0		44.2	37.0
Health care services	621–23	13,152	14.6	3.0	82.4	28.1	1.1	70.8	19.1	0.8 r		45.4	34.8
Social assistance	624	1,136	22.7	D	73.4	31.1	D	68.7	D	D		30.6	61.9
Arts, entertainment, and recreation	71	1,183	D	0.0	99.6	7.3 r	0.0	92.7	7.3 r	0.0		36.5	56.2
Accommodation and food services	72	5,872	12.9	5.9	81.2	22.1	4.2	73.7	12.9	2.7		30.1	54.3
Other services	81	5,527	8.1	4.0 r	87.9	24.1	2.4	73.5	15.4	0.0		48.0	36.5

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.

**TABLE 129**  
**Impact of producing cloud-based computing systems and applications or goods or services with cloud-based computing systems and applications 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	152,252	9.6	1.8	54.2	34.4	8.7	2.3	63.9	25.1	7.2	1.7	66.7	24.4	9.1	2.0	64.2	24.7							
Manufacturing industries	31–33	3,553	13.2	5.0	69.0	12.8	11.8	4.4	71.2	12.6	7.7	3.8	73.7	14.8	11.0	3.3	67.9	17.8							
Food	311	241	12.9	r	D	59.3	12.0	4.6	r	D	59.3	20.3	D	D	62.2	21.2	D	D	59.3	21.2					
Beverage and tobacco products	312	74	18.1		0.0	61.1	20.8	r	26.1	r	0.0	49.3	24.6	16.4	0.0	50.7	32.9	r	16.4	0.0	50.7	32.9	r		
Textile, apparel, and leather products	313–16	136	14.0	r	D	51.5	30.1	r	7.4	r	D	55.9	31.6	12.5	r	D	53.7	28.7	r	9.6	r	0.0	54.4	36.0	
Wood products	321	99	r	5.1	D	36.4	r	13.1	r	4.0	0.0	82.1	14.0	r	D	D	78.8	14.1	r	5.1	D	72.7	r	17.2	r
Paper	322	6	0.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	D	0.0	83.3	0.0	D	0.0	83.3	0.0						
Printing and related support activities	323	603	20.7	4.6	71.1	3.6	16.9	r	4.1	68.6	10.4	12.1	r	2.8	r	76.5	8.6	15.3	r	4.1	r	71.0	9.6		
Petroleum and coal products	324	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Chemicals	325	173	2.9	D	88.4	4.6	r	4.0	D	89.6	D	4.0	0.0	92.4	3.5	r	2.9	0.0	93.6	3.5	r				
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	48	r	0.0	0.0	100.0	0.0	0.0	D	D	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0						
Pharmaceuticals and medicines	3254	18	16.7	r	0.0	66.7	r	D	29.4	0.0	70.6	r	0.0	27.8	0.0	66.7	r	D	27.8	0.0	66.7	r	D		
Soap, cleaning compound, and toilet preparation manufacturing	3256	26	0.0	0.0	84.6	D	0.0	0.0	84.6	D	0.0	0.0	84.6	D	0.0	0.0	84.6	D							
Other chemicals	other 325	80	D	D	88.8	D	D	0.0	95.0	D	D	0.0	93.8	D	0.0	0.0	98.8	D							
Plastics and rubber products	326	118	r	D	D	93.2	0.0	D	D	86.4	D	D	D	96.6	0.0	D	D	89.8	D						
Nonmetallic mineral products	327	85	18.8	D	67.1	14.1	r	9.4	r	D	61.2	22.4	9.3	r	0.0	65.1	25.6	9.3	r	0.0	48.8	41.9			
Primary metals	331	5	80.0	0.0	D	0.0	D	0.0	D	0.0	D	0.0	D	0.0	D	D	D	0.0	D	D					

**TABLE 129**  
**Impact of producing cloud-based computing systems and applications or goods or services with cloud-based computing systems and applications 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											
Fabricated metal products	332	290	21.4	r	D	73.4	D	20.3	r	0.0	68.7	11.0	r	1.7	r	0.0	74.9	23.4	r	20.0	r	D	51.7	27.6	r				
Machinery	333	298	27.9	r	D	46.3	25.8	r	28.2	r	D	50.0	21.5	r	26.5	r	D	51.0	21.8	r	26.5	r	D	51.0	21.8	r			
Computer and electronic products	334	527	7.8		3.0	r	75.7	13.5	r	11.8		4.7	r	77.0	6.5	3.8	3.2	80.8	12.3	r	11.8		2.8	r	74.0	11.4	r		
Communications equipment	3342	111	0.0		0.0		87.2	12.8	r	D		0.0		85.6	D	D	D	90.1	D	D		0.0		85.6	D				
Semiconductor and other electronic components	3344	38	D		23.7	r	65.8	D		D		18.4	r	65.8	D	D	13.2	73.7	D	D		18.4	r	65.8	D				
Navigational, measuring, electromedical, and control instruments	3345	225	4.9		4.0	r	71.2	19.9	r	17.3	r	D		72.4	7.6	4.9	D	73.3	18.7	r	16.9	r	D		62.2	18.7	r		
Other computer and electronic products	other 334	154	18.2	r	0.0		76.6	D		6.5		D		81.2	7.1	4.5	D	86.4	9.1		7.1		D		85.7	7.1	r		
Electrical equipment, appliances, and components	335	114	20.6		0.0		53.6	25.9	r	15.9	r	0.0		72.6	11.5	19.7	r	0.0	64.1	16.3	r	15.7	r	0.0		61.7	22.6		
Transportation equipment	336	99	6.1	r	D		76.8	11.1	r	12.1		D		76.8	8.1	6.1	D	82.8	D		12.1		D		76.8	D			
Automobiles, bodies, trailers, and parts	3361–63	65	9.2	r	D		76.9	D		18.5		D		73.8	0.0	9.2	D	81.5	0.0		16.9	r	D		73.8	0.0			
Aerospace products and parts	3364	17	0.0		0.0		82.4	D		0.0		0.0		100.0	0.0	0.0	0.0	100.0	0.0		0.0		0.0		100.0	0.0			
Other transportation	other 336	18	0.0		0.0		66.7	r	D		0.0		0.0	57.9	r	42.1	r	0.0	0.0		66.7	r	D		D	0.0	72.2	r	D
Furniture and related products	337	125	D		D		88.0	8.8	r	D		D		89.6	D	D	0.0	92.8	D	D		0.0		88.8	8.8	r			
Miscellaneous	339	561	5.7		4.6	r	71.6	18.2	r	2.0		D		77.7	12.5	2.1	D	74.7	15.7	r	2.0		D		70.4	23.9	r		
Medical equipment and supplies	3391	238	5.5		D		81.5	3.8	r	3.8	r	D		89.5	4.2	3.8	r	89.1	3.8	r	3.8	r	D		83.2	3.8	r		
Other miscellaneous manufacturing	3399	324	5.9		D		64.5	28.4	r	D		D		69.1	18.8	r	D	63.3	24.4	r	D		0.0		60.5	38.9			

**TABLE 129**  
**Impact of producing cloud-based computing systems and applications or goods or services with cloud-based computing systems and applications 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					
Nonmanufacturing industries	11, 21–23, 42–81	148,700	9.5	1.7	53.8	35.0	8.6	2.2	63.8	25.4	7.2	1.6	66.6	24.6	9.1	2.0	64.0	24.9					
Agriculture, forestry, fishing, and hunting	11	204	0.0	0.0	60.8	D	0.0	0.0	60.8	r	D	0.0	0.0	60.8	r	D	0.0	0.0	60.8	r	D		
Mining, extraction, and support activities	21	40	D	0.0	85.0	D	0.0	0.0	90.0	D	0.0	0.0	92.5	D	0.0	0.0	90.0	D					
Utilities	22	14	50.0	r	0.0	50.0	r	0.0	D	0.0	64.3	r	0.0	D	0.0	64.3	r	0.0	D	0.0	64.3	r	0.0
Construction	23	7,818	13.2	1.8	r	57.1	27.9	11.3	D	64.5	23.5	11.5	D	67.8	19.4	12.5	D	63.6	22.7				
Wholesale trade	42	7,828	8.3	2.2	57.2	32.3	9.4	2.8	68.7	19.1	8.3	0.9	r	70.0	20.8	8.9	1.5	r	69.5	20.1			
Retail trade	44–45	10,439	6.3	2.9	56.5	34.3	7.3	2.5	65.2	25.0	5.0	1.6	r	66.0	27.4	7.3	1.4	r	62.7	28.6			
Transportation and warehousing	48–49	2,155	20.5	0.4	r	50.7	28.4	14.0	2.4	r	56.9	26.7	24.1	D	56.4	19.3	13.7	r	2.5	r	56.9	26.9	
Information	51	10,288	12.5	1.8	52.5	33.2	12.8	2.4	67.6	17.2	13.2	1.4	68.4	17.0	14.4	2.3	66.7	16.6					
Publishing	511	3,934	12.2	1.3	54.6	31.9	14.5	2.6	67.4	15.5	16.7	1.6	67.8	13.9	17.0	2.3	65.9	14.8					
Newspaper, periodical, book, and directory publishers	5111	315	10.5	6.3	73.0	10.2	D	6.7	86.0	6.7	D	6.3	83.2	6.3	4.4	r	6.7	71.3	17.6	r			
Software publishers	5112	3,618	12.4	0.9	53.0	33.7	15.7	2.2	65.9	16.2	17.9	1.2	66.4	14.5	18.0	1.9	r	65.5	14.6				
Telecommunications	517	1,243	10.0	1.0	r	44.2	44.9	4.9	D	68.3	24.7	7.3	r	D	62.8	28.6	6.2	2.7	r	67.9	23.2		
Data processing, hosting, and related services	518	3,829	13.3	2.7	50.8	33.2	15.4	3.2	65.8	15.6	13.2	1.7	r	69.0	16.1	16.0	2.8	65.1	16.1				
Other information	other 51	1,282	13.6	1.3	59.3	25.8	7.5	D	71.8	20.4	8.2	0.3	r	74.1	17.3	9.6	1.1	72.0	17.3				
Finance and insurance	52	8,355	10.5	D	48.7	40.3	12.8	1.9	55.8	29.5	8.7	D	57.6	33.2	13.3	1.5	r	58.1	27.1				
Real estate and rental and leasing	53	5,069	6.4	D	48.0	43.6	6.7	D	58.8	33.5	2.9	r	D	61.7	33.2	5.2	3.7	55.4	35.7				
Lessors of nonfinancial intangible assets (except copyrighted works)	533	D	0.0	0.0	0.0	D	0.0	0.0	D	0.0	0.0	0.0	D	0.0	0.0	0.0	0.0	D	0.0				

**TABLE 129**  
**Impact of producing cloud-based computing systems and applications or goods or services with cloud-based computing systems and applications 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	
Other real estate and rental and leasing	other 53	5,068	6.4	D	48.0	43.7	6.7	D	58.8	33.5	2.9	r	D	61.7	33.2	5.2	3.7	55.4	35.7
Professional, scientific, and technical services	54	60,394	9.3	1.2	53.3	36.2	8.6	1.9	64.7	24.8	6.3	1.2	67.9	24.6	9.0	1.9	65.5	23.6	
Legal services	5411	4,086	7.7	1.5	38.0	52.8	4.4	2.7	50.2	42.7	6.4	D	52.7	39.6	6.3	3.8	55.0	34.9	
Accounting, tax preparation, bookkeeping, and payroll services	5412	7,179	7.7	1.9	49.9	40.5	8.6	2.6	64.4	24.4	4.2	D	70.6	24.3	7.9	1.8	69.0	21.3	
Architectural, engineering, and related services	5413	4,304	7.4	1.0	67.2	24.4	6.3	2.0	73.7	18.0	5.5	D	77.6	16.4	6.8	0.8	76.0	16.4	
Specialized design services	5414	1,106	D	0.0	57.3	38.2	D	D	64.7	26.3	D	0.0	64.5	31.0	D	0.0	58.1	37.4	
Computer systems design and related services	5415	31,736	9.8	1.0	57.3	31.9	8.4	1.4	67.3	22.9	6.0	1.1	70.2	22.7	9.9	1.7	66.2	22.2	
Management, scientific, and technical consulting services	5416	8,132	11.1	1.8	41.3	45.7	12.9	1.1	59.7	26.3	8.5	0.9	63.1	27.5	8.7	1.5	62.9	26.9	
Scientific research and development services	5417	548	14.1	1.3	57.3	27.3	16.8	D	72.1	9.3	15.0	0.0	75.0	9.9	15.7	1.8	71.1	11.3	
Advertising, public relations, and related services	5418	1,556	6.9	1.7	52.5	38.9	7.4	5.7	61.9	25.0	7.6	2.6	66.5	23.3	10.9	4.8	61.2	23.1	
Other professional, scientific, and technical services	5419	1,751	11.8	0.0	47.7	40.4	7.6	6.1	54.4	31.9	7.7	7.3	52.6	32.4	7.5	D	61.1	28.0	
Management of companies and enterprises	55	55	0.0	0.0	0.0	100.0	0.0	0.0	D	D	0.0	0.0	D	D	0.0	0.0	D	D	
Administrative and support and waste management and remediation services	56	6,923	10.0	D	54.9	34.6	5.3	3.0	67.8	23.9	4.0	2.6	68.9	24.5	6.2	0.6	65.2	28.0	

**TABLE 129**  
**Impact of producing cloud-based computing systems and applications or goods or services with cloud-based computing systems and applications 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				
Educational services	61	2,242	10.2	D	44.2	43.8	10.2	D	62.0	25.9	16.3	D	51.6	28.3	10.2	r	D	64.1	21.9			
Health care and social assistance	62	14,288	9.5	1.9	54.4	34.2	8.3	3.1	61.5	27.1	6.5	3.4	66.7	23.4	9.0		2.0	62.5	26.5			
Health care services	621–23	13,152	10.3	1.7	r	57.1	30.9	8.1	3.3	62.8	25.8	6.1	2.9	67.9	23.1	8.7	2.1	63.0	26.2			
Social assistance	624	1,136	D	D	23.2	73.1	11.4	r	D	46.0	42.4	11.5	r	8.4	r	53.4	26.7	11.9	0.0	58.1	30.0	
Arts, entertainment, and recreation	71	1,183	0.0	0.0	48.2	51.8	D	0.0	48.6	51.1	D	0.0	58.2	41.5	D	D	53.3	46.2				
Accommodation and food services	72	5,872	11.0	6.0	53.3	29.7	5.9	r	5.2	55.6	33.3	6.8	4.5	63.6	25.1	5.9	6.1	62.0	26.0			
Other services	81	5,527	5.1	3.2	r	64.5	27.2	1.8	r	D	67.6	29.0	2.6	r	D	71.8	24.8	3.1	r	2.4	64.2	30.3

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.

TABLE 130

**Motivations for companies producing specialized software or goods or services with specialized software, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To upgrade goods or services	To expand the range of goods or services	To enter new markets or adapt existing products to new markets	To increase or maintain market share	To adopt standards and accreditation	Some other reason
All industries	11, 21–23, 31–33, 42–81	185,211	50.8	39.2	24.3	29.8	16.9	22.9
Manufacturing industries	31–33	9,294	59.4	44.6	31.6	33.9	14.0	17.4
Food	311	297	45.5	30.0	10.1 r	11.1	24.6 r	18.5
Beverage and tobacco products	312	60	25.0	18.3 r	16.7 r	50.0	16.7 r	43.3
Textile, apparel, and leather products	313–16	198	58.6	33.8	16.2 r	8.1 r	15.7 r	19.7
Wood products	321	239	78.2	37.2 r	13.0 r	25.1	10.0 r	13.0 r
Paper	322	35	68.6 r	62.9 r	65.7 r	65.7 r	57.1 r	14.3
Printing and related support activities	323	997	56.3	34.9	31.3	31.2	6.4	21.2
Petroleum and coal products	324	D	D	0.0	0.0	0.0	D	0.0
Chemicals	325	187	45.5	28.3	19.8	40.6	10.7	21.4 r
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	D	0.0	0.0	0.0	0.0	0.0	D
Pharmaceuticals and medicines	3254	46	52.2	26.1 r	28.3 r	52.2	D	D
Soap, cleaning compound, and toilet preparation manufacturing	3256	31	45.2 r	54.8	22.6 r	29.0 r	32.3	0.0
Other chemicals	other 325	108	41.7	24.1	13.9 r	41.7	D	32.4 r
Plastics and rubber products	326	290	57.6	18.3	19.0 r	9.7	7.9 r	29.7 r
Nonmetallic mineral products	327	79	53.2	21.5 r	16.5 r	38.0 r	15.2 r	31.6 r
Primary metals	331	80 r	31.3 r	10.0 r	7.5 r	7.5	68.8 r	D
Fabricated metal products	332	1,482	60.6	37.7	16.6	22.8	14.0	25.7
Machinery	333	1,631	58.7	42.1	33.8	40.0	8.5	19.7
Computer and electronic products	334	1,603	60.6	57.3	50.1	44.2	13.3	13.4
Communications equipment	3342	229	55.9	73.8	61.6	64.6	12.2 r	6.6 r
Semiconductor and other electronic components	3344	265	63.4	49.4	44.2	39.2	4.2	11.3
Navigational, measuring, electromedical, and control instruments	3345	889	61.5	60.1	51.3	41.1	16.6 r	14.6
Other computer and electronic products	other 334	220	59.1	39.5	40.5	40.9	13.2 r	17.7 r
Electrical equipment, appliances, and components	335	382	63.6	41.6	51.8	53.1	9.9	8.4
Transportation equipment	336	359	57.7	52.1	16.2	31.8	24.2 r	14.5 r
Automobiles, bodies, trailers, and parts	3361–63	280	57.1	51.4	11.8	27.9 r	25.4 r	13.2 r
Aerospace products and parts	3364	59	57.6 r	62.7	37.3 r	44.1 r	13.6 r	18.6 r
Other transportation	other 336	21	66.7 r	D	D	47.6 r	28.6 r	D
Furniture and related products	337	355	75.2	57.5	35.8	28.7	8.2 r	12.1 r
Miscellaneous	339	1,003	60.4	66.3	39.8	41.5	24.6	6.0
Medical equipment and supplies	3391	466	70.8	71.9	49.8	60.3	20.2	3.0 r
Other miscellaneous manufacturing	3399	536	51.1	61.6	31.3 r	25.0	28.7 r	8.4
Nonmanufacturing industries	11, 21–23, 42–81	175,917	50.3	38.9	23.9	29.5	17.1	23.2
Agriculture, forestry, fishing, and hunting	11	163 r	49.7	D	D	D	0.0	D
Mining, extraction, and support activities	21	279	64.5	14.3 r	3.2 r	14.7 r	7.5 r	26.5 r
Utilities	22	43	81.4	44.2	32.6 r	37.2	D	0.0
Construction	23	9,371	51.8	36.5	15.4	19.4	16.9	26.7
Wholesale trade	42	11,153	44.6	38.4	26.9	38.3	9.3	25.6

TABLE 130

**Motivations for companies producing specialized software or goods or services with specialized software, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To upgrade goods or services	To expand the range of goods or services	To enter new markets or adapt existing products to new markets	To increase or maintain market share	To adopt standards and accreditation	Some other reason
Retail trade	44–45	13,364	53.6	33.3	22.6	27.1	13.1	22.7
Transportation and warehousing	48–49	2,373	50.2	23.5	13.7	16.1	16.2	31.3
Information	51	9,206	52.9	55.9	42.5	50.9	13.8	14.9
Publishing	511	4,068	50.8	53.3	43.9	55.8	12.3	14.1
Newspaper, periodical, book, and directory publishers	5111	321	61.7	31.8	43.6	21.8	D	23.1
Software publishers	5112	3,746	49.8	55.1	43.9	58.8	13.2	13.3
Telecommunications	517	740	42.6	58.2	30.3	33.1	8.0	30.3
Data processing, hosting, and related services	518	2,958	55.5	60.5	45.5	51.9	13.9	11.4
Other information	other 51	1,441	59.1	52.4	39.2	44.3	20.5	16.2
Finance and insurance	52	9,632	43.9	31.1	22.7	31.9	14.0	26.8
Real estate and rental and leasing	53	6,609	46.0	25.6	13.3	22.2	18.3	28.7
Lessors of nonfinancial intangible assets (except copyrighted works)	533	113	r	D	D	D	0.0	0.0
Other real estate and rental and leasing	other 53	6,495	45.1	25.2	13.5	21.7	18.6	29.2
Professional, scientific, and technical services	54	66,529	52.5	47.7	29.8	36.4	17.5	18.6
Legal services	5411	4,486	51.6	21.9	8.9	22.3	16.9	28.7
Accounting, tax preparation, bookkeeping, and payroll services	5412	9,085	47.2	31.0	15.1	31.1	25.2	24.5
Architectural, engineering, and related services	5413	8,588	54.2	39.2	20.4	32.7	16.3	23.2
Specialized design services	5414	1,196	49.5	42.6	18.8	31.3	15.4	25.6
Computer systems design and related services	5415	30,073	55.2	58.3	38.5	39.9	16.0	14.7
Management, scientific, and technical consulting services	5416	8,304	49.2	53.0	35.4	39.6	18.6	15.3
Scientific research and development services	5417	979	48.5	48.3	52.5	34.8	18.9	14.4
Advertising, public relations, and related services	5418	1,320	46.7	52.3	38.2	37.0	17.3	15.0
Other professional, scientific, and technical services	5419	2,500	52.5	38.9	21.4	42.8	10.0	20.5
Management of companies and enterprises	55	88	r	0.0	0.0	D	D	0.0
Administrative and support and waste management and remediation services	56	8,611	54.6	41.5	26.2	29.8	15.2	25.4
Educational services	61	2,634	58.4	44.4	35.2	27.8	21.4	20.1
Health care and social assistance	62	18,351	45.9	23.3	8.2	12.4	31.1	27.2
Health care services	621–23	17,018	46.2	23.3	7.9	11.8	32.5	26.4
Social assistance	624	1,333	42.7	22.8	12.2	r	20.6	37.6
Arts, entertainment, and recreation	71	2,164	50.0	32.8	20.6	16.5	9.8	26.9
Accommodation and food services	72	6,864	45.8	16.7	11.9	16.2	15.7	37.0
Other services	81	8,474	47.8	38.2	17.2	15.2	10.5	29.1

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

NAICS = 2017 North American Industry Classification System.



**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. 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.

TABLE 131

**Impact of producing specialized software or goods or services with specialized software 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	185,211	14.7	3.0	82.3	29.8	1.3	68.9	23.0	0.7	45.2	31.0									
Manufacturing industries	31–33	9,294	16.2	5.8	78.0	31.5	1.9	66.6	30.4	0.8	50.3	18.5									
Food	311	297	8.1	r	D	79.5	16.5	14.5	r	69.0	8.8	r	D	31.6	48.1						
Beverage and tobacco products	312	60	16.7		D	78.3	21.7	D		73.3	16.7		D	70.0	10.0						
Textile, apparel, and leather products	313–16	198	7.1	r	D	85.9	16.7	D		79.8	10.6	r	0.0	42.4	47.0						
Wood products	321	239	18.3		26.7	r	55.0	r	23.8	D	74.5	13.0	r	D	69.5	16.3					
Paper	322	35	D		D		51.4	r	56.8	r	0.0	43.2	r	62.9	r	0.0	25.7	r	D		
Printing and related support activities	323	997	11.6	r	3.8		84.6		24.1	1.0	r	74.9		20.7		0.7	r	41.7	36.9		
Petroleum and coal products	324	D	0.0		0.0		D		D	0.0		D		D		0.0		0.0	D		
Chemicals	325	187	5.9		D		84.5		18.9	0.0		81.1		17.1		0.0		63.6	19.3		
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	D	0.0		0.0		D		0.0	0.0		D		0.0		0.0		D	0.0		
Pharmaceuticals and medicines	3254	46	10.9		D		87.0		33.3	r	0.0	66.7		45.7	r	0.0		50.0	r	D	
Soap, cleaning compound, and toilet preparation manufacturing	3256	31	D		0.0		90.3		16.6	r	0.0	83.4		17.2	r	0.0		48.3	34.5	r	
Other chemicals	other 325	108	D		D		81.5		14.0	r	0.0	86.0		6.6		0.0		72.6	20.8	r	
Plastics and rubber products	326	290	11.6	r	5.2		83.2		12.1		D	85.5		10.0	r	D		63.1	24.1	r	
Nonmetallic mineral products	327	79	26.6		D		70.9		16.5	r	D	74.7		15.0	r	0.0		58.7	26.3	r	
Primary metals	331	80	r	D		D		93.8		11.2	r	0.0		88.8		15.0	r	0.0	80.0	D	
Fabricated metal products	332	1,482	19.6		9.6	r	70.7		39.4		4.4	r	56.2		40.4		D	39.2	20.1		
Machinery	333	1,631	22.3		2.1	r	75.6		35.9		0.0	64.1		37.3		0.0		52.8	9.9		
Computer and electronic products	334	1,603	16.1		4.1	r	79.8		30.1		1.2	r	68.7		32.5		D	60.1	7.2		
Communications equipment	3342	229	13.6		0.0		86.4		20.2		0.0	79.8		26.4		0.0		71.3	2.2	r	
Semiconductor and other electronic components	3344	265	12.5	r	13.2	r	74.2		27.5		D	66.8		17.4		0.0		69.0	13.6	r	
Navigational, measuring, electromedical, and control instruments	3345	889	18.6		3.0	r	78.4		33.5		D	65.9		39.4		D		54.1	6.2		
Other computer and electronic products	other 334	220	13.6		D		84.5		30.9		D	69.1		29.0		0.0		62.0	9.1	r	
Electrical equipment, appliances, and components	335	382	30.8		0.0		69.2		44.4		0.0	55.6		49.2		0.0		46.6	4.2		
Transportation equipment	336	359	8.4		1.9	r	89.7		30.1		D	69.1		22.0		D		53.2	r	24.2	r
Automobiles, bodies, trailers, and parts	3361–63	280	6.1		2.5	r	91.5		28.6		D	70.0		19.6	r	D		51.4	r	27.5	r
Aerospace products and parts	3364	59	23.3	r	0.0		76.7		36.7	r	0.0	63.3	r	32.2	r	0.0		64.4	r	D	
Other transportation	other 336	21	0.0		0.0		100.0		D		0.0	81.0	r	D		0.0		42.9	r	D	
Furniture and related products	337	355	25.6	r	6.8	r	67.6		42.6		0.0	57.4		40.6		0.0		34.9	24.5		

TABLE 131

**Impact of producing specialized software or goods or services with specialized software 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	1,003	7.8	5.9	r	86.3	33.7	D	66.1	29.2	0.0	54.7	16.1	r			
Medical equipment and supplies	3391	466	5.6	12.9	r	81.5	53.6	D	45.7	52.7	0.0	36.4	10.9	r			
Other miscellaneous manufacturing	3399	536	9.5	r	D	90.1	16.2	r	D	83.8	8.6	r	0.0	70.7	20.7	r	
Nonmanufacturing industries	11, 21–23, 42–81	175,917	14.6	2.9		82.5	29.7	1.2	69.1	22.7	0.7	44.9	31.7				
Agriculture, forestry, fishing, and hunting	11	163	r	D		100.0	D	0.0	100.0	D	0.0	D	73.0				
Mining, extraction, and support activities	21	279	1.8	0.0		98.2	36.6	r	0.0	63.4	r	17.5	r	0.0	56.8	25.7	r
Utilities	22	43	13.7	0.0		86.3	51.2	0.0	48.8	46.5	0.0	46.5	D				
Construction	23	9,371	18.1	2.8		79.1	29.4	2.1	r	68.5	18.5	D	51.6	28.9			
Wholesale trade	42	11,153	9.9	3.0		87.1	26.4	1.0	r	72.6	19.7	D	52.2	27.6			
Retail trade	44–45	13,364	11.9	3.0		85.1	24.3	2.3		73.4	16.3	1.2	r	43.2	39.3		
Transportation and warehousing	48–49	2,373	19.8	6.5		73.7	25.1	1.3		73.6	12.4	0.0	39.7	47.9			
Information	51	9,206	22.2	3.8		74.0	36.4	0.7		62.9	33.3	0.5	49.9	16.2			
Publishing	511	4,068	23.5	3.4		73.1	34.7	0.7	r	64.6	33.9	0.3	r	55.8	10.0		
Newspaper, periodical, book, and directory publishers	5111	321	8.4	r	20.0	r	71.6	20.2	D	79.8	13.7	0.0	49.5	36.8			
Software publishers	5112	3,746	24.8	2.0		73.2	36.0	0.7		63.3	35.6	0.4	r	56.3	7.7		
Telecommunications	517	740	15.5	r	4.5	r	80.0	35.1	D	64.5	30.9	D	39.2	29.2			
Data processing, hosting, and related services	518	2,958	23.4	3.2		73.4	39.5	D	60.0	34.2	D	48.9	16.3				
Other information	other 51	1,441	19.8	6.0	r	74.2	35.6	1.6	r	62.8	30.8	D	41.2	27.1			
Finance and insurance	52	9,632	17.3	2.6		80.1	28.0	0.0		72.0	20.0	0.0	40.0	40.0			
Real estate and rental and leasing	53	6,609	9.1	2.0	r	88.9	20.1	D	79.7	9.2	D	40.2	50.4				
Lessors of nonfinancial intangible assets (except copyrighted works)	533	113	r	100.0		D	D	0.0	D	D	0.0	D	D				
Other real estate and rental and leasing	other 53	6,495	7.5	2.0	r	90.5	19.6	D	80.3	9.3	D	40.1	50.4				
Professional, scientific, and technical services	54	66,529	15.0	2.4		82.6	33.2	0.6		66.2	28.6	0.2	48.8	22.3			
Legal services	5411	4,486	8.4	4.2		87.4	25.0	1.9	r	73.1	12.8	D	27.6	59.6			
Accounting, tax preparation, bookkeeping, and payroll services	5412	9,085	10.9	2.1		87.0	22.3	D	77.6	15.5	0.0	51.0	33.5				
Architectural, engineering, and related services	5413	8,588	13.4	1.5		85.1	32.5	0.6	r	66.9	30.7	0.5	r	58.9	9.9		
Specialized design services	5414	1,196	8.1	r	D	87.7	24.9	0.0		75.1	14.9	0.0	43.9	41.1			
Computer systems design and related services	5415	30,073	16.2	1.9		81.9	35.7	0.3		64.0	32.6	0.1	r	51.7	15.6		
Management, scientific, and technical consulting services	5416	8,304	19.1	3.5		77.4	41.3	1.5	r	57.2	34.8	D	42.9	21.4			
Scientific research and development services	5417	979	23.4	1.7	r	74.9	42.4	0.0		57.6	48.9	0.0	43.2	8.0			
Advertising, public relations, and related services	5418	1,320	13.5	2.3		84.2	29.2	0.9		69.9	24.4	D	42.5	32.9			
Other professional, scientific, and technical services	5419	2,500	20.5	3.0	r	76.5	33.6	0.0		66.4	30.5	0.0	36.2	33.4			

TABLE 131

**Impact of producing specialized software or goods or services with specialized software 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	88	r	D	0.0	D	D	0.0	D	D	0.0	D	D		
Administrative and support and waste management and remediation services	56	8,611		18.7	4.4	76.9	28.9	4.2	66.9	18.9	2.0	r	39.4	39.7	
Educational services	61	2,634		23.4	D	75.0	41.5	D	56.9	30.8	0.0		26.5	42.7	
Health care and social assistance	62	18,351		13.1	2.3	84.6	26.9	1.5	71.6	16.6	1.3		42.5	39.6	
Health care services	621–23	17,018		12.1	2.2	85.7	27.3	1.4	71.3	17.9	1.4		44.2	36.6	
Social assistance	624	1,333		26.3	D	70.6	21.4	D	75.5	D	0.0		21.8	78.1	
Arts, entertainment, and recreation	71	2,164		4.5	r	7.1	r	88.4	20.9	D	77.0	13.6	D	36.1	45.4
Accommodation and food services	72	6,864		12.9	6.1	81.0	23.2	2.4	r	74.4	12.2	3.0	r	30.8	54.0
Other services	81	8,474		9.7	2.5	r	87.8	29.5	2.1	r	68.4	24.3	0.0	35.9	39.8

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

TABLE 132

**Impact of producing specialized software or goods or services with specialized software 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	185,211	8.7	1.9	55.0	34.4	7.6	2.1	64.6	25.7	6.6	1.5	67.8	24.1	7.9	1.6	65.8	24.7									
Manufacturing industries	31–33	9,294	11.1	6.0	74.1	8.8	10.6	2.5	77.7	9.2	9.2	2.0	79.4	9.4	9.8	2.2	75.8	12.2									
Food	311	297	8.8	r	D	64.3	14.8	r	4.0	r	D	69.4	14.8	r	9.8	r	D	61.6	16.8	7.7	r	D	64.6	15.8	r		
Beverage and tobacco products	312	60	16.7		D	78.3	0.0		16.7		D	78.3	0.0		D		D	83.3	0.0		D		D	83.3	0.0		
Textile, apparel, and leather products	313–16	198	9.6	r	D	64.1	19.2	r	12.6	r	D	67.7	16.7	r	14.1	r	D	66.2	16.7	r	6.6	r	D	62.1	24.7		
Wood products	321	239	11.3	r	D	64.4	5.0		D		D	84.9	7.5		9.6	r	D	77.0	11.3		3.3	r	D	48.1	r	40.2	r
Paper	322	35	D		D	40.0	r	D		D		0.0	85.7		D		0.0	82.9	r	D		D		0.0	85.7		D
Printing and related support activities	323	997	10.3	r	3.4	72.8	13.5	r	8.7	r	1.8	r	70.0	19.5	13.1	r	2.5	66.6	17.9		9.1	r	1.6	r	69.3	20.0	
Petroleum and coal products	324	D	0.0		0.0	D	0.0		0.0		0.0		D	0.0	0.0		0.0	D	0.0		0.0		0.0		D	0.0	
Chemicals	325	187	5.9		D	78.6	6.4	r	4.3		D	87.7	4.8	r	3.7		D	84.5	8.6	r	5.3		D	86.6	4.8	r	
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	D	0.0		0.0	D	0.0		0.0		0.0		D	0.0	0.0		0.0	D	0.0		0.0		0.0		D	0.0	
Pharmaceuticals and medicines	3254	46	10.9		D	73.9	D		10.9		D	82.6	0.0		10.9		D	82.6	0.0		19.6		D	73.9	0.0		
Soap, cleaning compound, and toilet preparation manufacturing	3256	31	D		0.0	90.3	0.0		0.0		0.0		87.1	D	0.0		0.0	100.0	0.0		0.0		0.0		87.1	D	
Other chemicals	other 325	108	D		D	78.7	D		D		0.0	91.7	D		D		0.0	82.4	14.8	r	D		0.0	93.5	D		
Plastics and rubber products	326	290	4.5		5.2	85.9	D		10.0	r	5.2		82.8	D	3.4		6.6	r	85.2	D		8.6	r	D	86.6	D	
Nonmetallic mineral products	327	79	20.3		6.3	r	58.2	15.2	r	16.7	r	11.5	r	56.4	15.4	r	15.2	r	D	67.1	16.5	r	16.5	r	D	46.8	35.4
Primary metals	331	80	r	8.8	r	D	91.3	0.0		D		0.0	100.0	0.0		8.6	r	0.0	91.4	0.0		D		D	97.5	0.0	

TABLE 132

**Impact of producing specialized software or goods or services with specialized software 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											
Fabricated metal products	332	1,482	12.9	9.5	r	76.1	1.5	r	15.0	r	D	76.3	7.0	r	9.6	r	D	85.2	5.0	r	13.6	r	D	72.1	12.4				
Machinery	333	1,631	17.5	3.9	r	67.6	11.0	r	10.5		D	82.7	6.4	r	10.6		0.0	83.4	6.0	r	13.4		D	80.3	5.8				
Computer and electronic products	334	1,603	8.0	3.2		79.4	9.4		10.9		3.9	79.0	6.3		8.3		3.1	81.6	7.0		7.5		2.4	82.1	8.0				
Communications equipment	3342	229	3.1	0.0		88.7	8.2	r	9.6	r	0.0	83.8	6.6	r	D		0.0	91.7	7.4	r	3.5		0.0	87.0	9.6				
Semiconductor and other electronic components	3344	265	8.4	r	9.5	r	61.5	20.6	r	3.0		12.6	r	76.1	8.3	r	10.7	r	7.6	r	71.9	9.9	r	3.4	5.3	r	79.3	12.1	
Navigational, measuring, electromedical, and control instruments	3345	889	9.4		2.7	r	82.4	5.5		14.4		3.3		77.1	5.3	r	10.2	r	3.0	r	80.7	6.1		10.2	2.7	r	80.9	6.2	
Other computer and electronic products	other 334	220	6.8		D		79.1	12.7	r	5.9		D		85.5	8.2	r	3.6	r	D		87.7	8.2	r	5.0		D	86.4	8.2	
Electrical equipment, appliances, and components	335	382	11.0		D		80.6	8.4	r	10.5		D		86.4	3.1		7.1		D		86.9	6.0		11.3	0.0	81.6	7.1		
Transportation equipment	336	359	6.0		5.5	r	70.5	17.9	r	6.4		1.9	r	76.9	D		7.2	r	D		75.5	D		5.3	1.9	r	77.7	D	
Automobiles, bodies, trailers, and parts	3361–63	280	3.6		7.1	r	69.3	20.0	r	6.4		2.5	r	72.5	D		5.7	r	D		73.6	D		5.4	2.5	r	73.6	D	
Aerospace products and parts	3364	59	D		0.0		74.6	D		8.5		0.0		91.5	0.0		D		0.0		83.1	0.0		8.5	0.0	91.5	0.0		
Other transportation	other 336	21	0.0		0.0		81.0	r	D		0.0		0.0	100.0	0.0		0.0		0.0		81.0	r	D	0.0	0.0	100.0	0.0		
Furniture and related products	337	355	24.5	r	D		60.8	8.7	r	21.4	r	D		64.5	9.9	r	23.1	r	D		57.7	14.9	r	16.1	r	0.0	73.5	10.4	
Miscellaneous	339	1,003	4.4	r	6.8	r	81.6	7.2		9.3		1.0	r	76.9	12.8		1.8		D		84.8	12.5		5.3	r	2.7	r	75.1	16.9
Medical equipment and supplies	3391	466	4.1		14.6	r	78.5	2.8	r	2.8		D		84.3	10.7	r	2.4	r	D		91.2	4.3		2.1	r	5.8	r	75.6	16.5
Other miscellaneous manufacturing	3399	536	4.5	r	D		84.1	10.8	r	14.7	r	D		70.5	14.7		0.9	r	0.0		79.3	19.8		7.8	r	D	74.8	17.4	

TABLE 132

**Impact of producing specialized software or goods or services with specialized software 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										
Nonmanufacturing industries	11, 21–23, 42–81	175,917	8.6	1.7	53.9	35.8	7.5	2.0	64.0	26.5	6.4	1.4	67.3	24.9	7.8	1.6	65.2	25.4										
Agriculture, forestry, fishing, and hunting	11	163	r	D	0.0	74.2	D	D	0.0	100.0	0.0	D	0.0	100.0	0.0	D	0.0	76.1	D									
Mining, extraction, and support activities	21	279	3.2	r	0.0	71.5	25.3	r	D	0.0	74.2	25.1	r	1.8	0.0	92.2	6.1	r	D	0.0	86.0	13.3	r					
Utilities	22	43	14.0		0.0	65.1	20.9	r	11.6	0.0	83.7	D	11.6	0.0	88.4	0.0	11.6	0.0	88.4	0.0								
Construction	23	9,371	13.8		D	59.4	26.2		8.2	D	69.8	21.5	13.7	D	67.4	17.9	8.1	D	67.8	24.1								
Wholesale trade	42	11,153	4.7	0.8	r	58.1	36.4		7.4	1.1	r	71.0	20.5	6.1	1.1	r	71.7	21.1	8.4	1.1	r	67.2	23.3					
Retail trade	44–45	13,364	5.0	2.2		56.4	36.4		6.7	2.3		62.2	28.8	4.1	2.5		64.7	28.7	4.6	2.5		65.8	27.1					
Transportation and warehousing	48–49	2,373	11.3	4.2	r	46.6	37.8		4.9	r	0.5	r	58.5	36.1	13.4	0.5	r	62.8	23.3	9.7	2.4	r	55.2	32.7				
Information	51	9,206	10.9	2.7		56.0	30.4		11.6	3.4		68.8	16.2	11.4	1.2		74.3	13.1	13.3	2.8		70.1	13.8					
Publishing	511	4,068	9.8	2.7	r	59.3	28.2		12.9	3.6		71.9	11.6	12.1	1.1		77.7	9.1	14.4	3.4		73.6	8.6					
Newspaper, periodical, book, and directory publishers	5111	321	1.9	r	20.1	r	62.0	16.0	1.6	r	21.1	r	64.4	12.9	r	D	3.1	r	82.2	13.7	r	1.9	r	21.6	r	64.6	11.9	r
Software publishers	5112	3,746	10.5	1.2		59.0	29.3		13.8	2.1		72.6	11.5	13.0	0.9		77.4	8.7	15.4	1.8	r	74.5	8.3					
Telecommunications	517	740	8.8	r	1.5	r	46.9	42.8	4.9	5.7	r	64.8	24.7	9.6	r	3.8	r	64.0	22.6	4.5	5.7	r	68.0	21.8				
Data processing, hosting, and related services	518	2,958	11.6	3.4		55.5	29.5		13.5	1.8		67.8	16.9	11.6	1.1	r	75.3	12.0	14.4	2.0		68.8	14.8					
Other information	other 51	1,441	14.0	2.0	r	51.9	32.1		7.6	5.1	r	63.9	23.4	9.6	D		68.2	22.0	13.0	r	1.3		63.3	22.5				
Finance and insurance	52	9,632	9.4	1.5	r	50.9	38.2		9.8	1.7		59.3	29.2	5.9	1.0	r	62.8	30.3	11.2	1.3	r	60.9	26.6					
Real estate and rental and leasing	53	6,609	3.4	D		54.0	42.0		5.7	0.0		55.9	38.4	0.9	r	D		66.0	32.5	3.8	1.3	r	57.3	37.6				
Lessors of nonfinancial intangible assets (except copyrighted works)	533	113	r	D	0.0	D	D		D	0.0	D	0.0	0.0	0.0	100.0	0.0	D	0.0	D	0.0	D	D	D					

TABLE 132

**Impact of producing specialized software or goods or services with specialized software 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				
Other real estate and rental and leasing	other 53	6,495	2.6	D	54.1	42.7	5.0	0.0	55.9	39.1	1.0	r	D	65.4	33.1	3.0	r	1.3	r	58.3	37.4	
Professional, scientific, and technical services	54	66,529	8.6	1.3	53.3	36.8	7.2	1.8	65.3	25.7	5.8		1.2	67.1	25.9	8.2		1.6		66.3	23.9	
Legal services	5411	4,486	4.8	0.7	r	40.7	53.8	4.8	3.2	r	52.6	39.4	5.8	1.3	r	52.2	40.7	8.4	3.7		53.6	34.3
Accounting, tax preparation, bookkeeping, and payroll services	5412	9,085	4.4	1.1	r	51.7	42.8	5.8	1.9	r	64.9	27.4	2.3	D	69.0	28.3	6.3	2.3	r	66.8	24.6	
Architectural, engineering, and related services	5413	8,588	8.2	1.1		62.9	27.8	5.4	1.7		72.3	20.6	6.2	0.4	r	74.9	18.5	6.2	0.4	r	77.7	15.7
Specialized design services	5414	1,196	D	D	51.9	43.4	D	D	65.1	28.0	D	0.0	65.4	31.9	D	0.0	63.8	33.4				
Computer systems design and related services	5415	30,073	9.5	0.9		56.1	33.5	7.5	1.0		67.1	24.4	6.0	1.2		68.3	24.5	8.5	1.1		67.2	23.2
Management, scientific, and technical consulting services	5416	8,304	10.2	3.1		43.7	43.0	9.3	2.4		61.9	26.4	7.7	2.4		63.5	26.4	10.3	2.5		62.1	25.1
Scientific research and development services	5417	979	12.6	1.7	r	56.8	28.9	16.0	3.1	r	68.8	12.1	12.4	D	75.4	11.6	15.7	3.1	r	69.4	11.8	
Advertising, public relations, and related services	5418	1,320	6.8	2.7	r	54.7	35.8	7.7	4.3		65.4	22.7	4.4	D	73.0	22.6	7.2	2.0		69.6	21.2	
Other professional, scientific, and technical services	5419	2,500	16.6	D	46.9	34.6	11.1	4.0	r	53.0	31.9	8.5	4.1	r	52.9	34.5	9.9	D		50.2	37.9	
Management of companies and enterprises	55	88	r	D	0.0	D	D	D	0.0	D	D	0.0	0.0	D	D	0.0	0.0	D	D		D	D
Administrative and support and waste management and remediation services	56	8,611	10.9	3.1		50.7	35.3	7.9	4.0		61.9	26.2	5.2	3.1		68.6	23.1	7.9	2.0	r	62.7	27.4



TABLE 132

**Impact of producing specialized software or goods or services with specialized software 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
Educational services	61	2,634	8.6	D	41.0	50.3	11.8	0.0	61.7	26.5	12.3	0.0	60.7	27.0	11.8	0.0	66.6	21.6
Health care and social assistance	62	18,351	8.9	2.0	52.5	36.6	8.2	2.7	60.8	28.3	6.4	2.5	67.7	23.4	7.5	1.6	64.6	26.3
Health care services	621–23	17,018	9.6	1.9	54.4	34.1	8.8	3.0	61.3	26.9	6.4	2.4	68.2	23.0	7.9	1.7	64.2	26.2
Social assistance	624	1,333	0.0	D	28.9	68.1	0.0	0.0	54.0	46.0	D	D	61.1	28.3	D	0.0	68.3	28.3
Arts, entertainment, and recreation	71	2,164	D	7.1	r 56.5	36.4	D	6.8	r 58.8	32.4	4.7	r 4.9	r 60.5	29.9	D	D	67.4	25.7
Accommodation and food services	72	6,864	12.8	4.0	r 46.7	36.4	9.2	3.9	49.8	37.1	9.2	D	63.0	26.9	6.4	D	59.0	33.0
Other services	81	8,474	8.4	0.9	r 61.7	29.0	2.2	r 1.7	r 69.6	26.5	2.9	D	68.7	27.9	3.0	D	67.1	29.2

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

TABLE 133

**Motivations for companies producing robotics or goods or services with robotics, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To upgrade goods or services		To expand the range of goods or services		To enter new markets or adapt existing products to new markets		To increase or maintain market share		To adopt standards and accreditation		Some other reason	
All industries	11, 21–23, 31–33, 42–81	15,043		45.5		41.9		32.8		35.0		12.4		23.4
Manufacturing industries	31–33	2,968		58.7		50.5		44.7		48.9		16.1		13.0
Food	311	50		44.0	r	8.0		12.0	r	30.0	r	10.0	r	38.0
Beverage and tobacco products	312	9		44.4	r	66.7	r	0.0		66.7	r	D		D
Textile, apparel, and leather products	313–16	17	r	D		D		D		D		0.0		88.2
Wood products	321	72	r	77.8	r	D		D		6.9		D		22.2
Paper	322	11		27.3		27.3		27.3		54.5		D		27.3
Printing and related support activities	323	56		78.6		71.4		60.7		73.2		D		0.0
Petroleum and coal products	324	0		0.0		0.0		0.0		0.0		0.0		0.0
Chemicals	325	49		22.4	r	14.3	r	14.3	r	42.9	r	0.0		D
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	0		0.0		0.0		0.0		0.0		0.0		0.0
Pharmaceuticals and medicines	3254	D		D		0.0		0.0		0.0		0.0		0.0
Soap, cleaning compound, and toilet preparation manufacturing	3256	0		0.0		0.0		0.0		0.0		0.0		0.0
Other chemicals	other 325	44		15.9	r	15.9	r	15.9	r	47.7	r	0.0		D
Plastics and rubber products	326	217		89.9		42.9	r	35.5	r	67.3		5.5	r	5.5
Nonmetallic mineral products	327	13		61.5	r	D		D		69.2		D		D
Primary metals	331	56	r	14.3		8.9		7.1		8.9		D		0.0
Fabricated metal products	332	539		55.7		65.5		62.9		63.1		27.3		7.8
Machinery	333	1,047		56.6		48.6		49.9		55.4		15.3		13.4
Computer and electronic products	334	316		62.0		46.5		35.8		32.0	r	5.4	r	17.1
Communications equipment	3342	8	r	D		75.0		75.0		75.0		D		D
Semiconductor and other electronic components	3344	77		55.8		59.7		31.2	r	45.5	r	11.7	r	19.5
Navigational, measuring, electromedical, and control instruments	3345	214		66.4		43.0		36.0		25.2	r	D		13.6
Other computer and electronic products	other 334	16		31.3		18.8		25.0	r	25.0	r	0.0		37.5
Electrical equipment, appliances, and components	335	91		69.2		42.9		33.0		22.0		7.7	r	15.4
Transportation equipment	336	149		36.9		32.2		30.2		53.0		22.1	r	4.7
Automobiles, bodies, trailers, and parts	3361–63	121		34.7		20.7	r	24.0		53.7	r	26.4	r	D
Aerospace products and parts	3364	25		44.0	r	80.0		64.0		52.0	r	D		D
Other transportation	other 336	D		D		D		D		D		0.0		0.0
Furniture and related products	337	86	r	73.3		70.9	r	D		10.5	r	D		7.0
Miscellaneous	339	186		62.9		69.4		72.0		32.8		20.4		14.0
Medical equipment and supplies	3391	157		65.0		73.9		73.2		26.8	r	19.7	r	12.7
Other miscellaneous manufacturing	3399	30		53.3		43.3	r	60.0		60.0		26.7	r	D
Nonmanufacturing industries	11, 21–23, 42–81	12,076		42.2		39.7		29.8		31.6		11.4		26.0
Agriculture, forestry, fishing, and hunting	11	0		0.0		0.0		0.0		0.0		0.0		0.0
Mining, extraction, and support activities	21	D		D		D		D		D		D		D
Utilities	22	D		D		D		D		D		D		0.0
Construction	23	744		47.7		51.2		38.0		23.5	r	D		D
Wholesale trade	42	2,288		36.4		38.1		34.6		42.4		10.1		21.2

TABLE 133

**Motivations for companies producing robotics or goods or services with robotics, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To upgrade goods or services	To expand the range of goods or services	To enter new markets or adapt existing products to new markets	To increase or maintain market share	To adopt standards and accreditation	Some other reason
Retail trade	44–45	1,725	46.6	24.5	23.1	23.2	9.4	23.7
Transportation and warehousing	48–49	69 r	27.5 r	17.4 r	D	18.8 r	18.8 r	87.0
Information	51	332	69.3	66.9	42.5 r	45.2 r	17.8 r	9.0 r
Publishing	511	63	74.6	58.7 r	57.1 r	71.4	D	D
Newspaper, periodical, book, and directory publishers	5111	D	D	D	D	D	D	D
Software publishers	5112	59	74.6	55.9 r	54.2 r	69.5	D	D
Telecommunications	517	14 r	D	D	0.0	0.0	0.0	D
Data processing, hosting, and related services	518	54	81.5	90.7	79.6	75.9	D	D
Other information	other 51	201 r	64.7	65.2	30.8 r	32.8 r	D	D
Finance and insurance	52	178	29.8 r	23.6 r	23.0 r	48.9 r	D	21.9 r
Real estate and rental and leasing	53	183 r	D	D	D	D	D	69.4 r
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0.0	0.0	0.0	0.0	0.0	0.0
Other real estate and rental and leasing	other 53	183 r	D	D	D	D	D	69.4 r
Professional, scientific, and technical services	54	2,729	44.8	51.6	37.6	36.8	13.9	27.6
Legal services	5411	D	0.0	0.0	0.0	0.0	0.0	D
Accounting, tax preparation, bookkeeping, and payroll services	5412	5	D	100.0	100.0	D	D	0.0
Architectural, engineering, and related services	5413	1,314	42.3	49.2	30.1	33.6	6.9	31.4
Specialized design services	5414	5	D	D	0.0	D	0.0	D
Computer systems design and related services	5415	783	54.0	63.7	46.6	51.2	22.1	18.6
Management, scientific, and technical consulting services	5416	321	36.1 r	49.8	48.9	25.5	23.1 r	6.5 r
Scientific research and development services	5417	159	50.3	41.5	47.8	30.2	10.7	30.2
Advertising, public relations, and related services	5418	12	66.7	66.7	D	41.7 r	0.0	D
Other professional, scientific, and technical services	5419	79 r	D	D	D	D	D	D
Management of companies and enterprises	55	0	0.0	0.0	0.0	0.0	0.0	0.0
Administrative and support and waste management and remediation services	56	772	53.0	33.5	11.0 r	33.8	D	28.8 r
Educational services	61	170 r	0.0	100.0	D	D	0.0	0.0
Health care and social assistance	62	1,188	47.0	35.1	29.1	16.8 r	4.0 r	24.7
Health care services	621–23	1,146	48.7	36.4	30.2	13.8 r	4.2 r	25.6
Social assistance	624	D	0.0	0.0	0.0	D	0.0	0.0
Arts, entertainment, and recreation	71	179 r	D	D	D	D	D	D
Accommodation and food services	72	754	22.0 r	29.7	30.0	D	23.1 r	49.1
Other services	81	757	45.2	29.2	19.6	32.6	D	30.3

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

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. 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.

TABLE 134

**Impact of producing robotics or goods or services with robotics 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	15,043	16.1	5.9	78.0	30.6	2.6	66.8	28.5	1.4	r	43.9	26.2								
Manufacturing industries	31–33	2,968	19.4	11.2	69.4	46.0	1.9	r	52.1	45.9		D	43.1	10.6							
Food	311	50	D	D	82.0	10.0	r	D	86.0	12.0	r	0.0	54.0	r	D						
Beverage and tobacco products	312	9	D	D	D	D		0.0	77.8	D		0.0	77.8		0.0						
Textile, apparel, and leather products	313–16	17	r	D	D	D		D	D	D		D	0.0	D							
Wood products	321	72	r	D	D	30.6	r	D	0.0	95.8		D	0.0	73.6	r	D					
Paper	322	11		0.0	D	81.8		D	0.0	81.8		50.0	0.0	50.0		0.0					
Printing and related support activities	323	56		D	D	76.8		48.2	D	44.6		21.8	r	0.0	38.2	r	40.0	r			
Petroleum and coal products	324	0		0.0	0.0	0.0		0.0	0.0	0.0		0.0		0.0		0.0		0.0			
Chemicals	325	49		D	D	67.3	r	17.0	r	0.0		83.0	20.4	r	0.0	71.4		D			
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	0		0.0	0.0	0.0		0.0		0.0		0.0		0.0		0.0		0.0			
Pharmaceuticals and medicines	3254	D		D	0.0	D		D		0.0		D		D		0.0		0.0			
Soap, cleaning compound, and toilet preparation manufacturing	3256	0		0.0	0.0	0.0		0.0		0.0		0.0		0.0		0.0		0.0			
Other chemicals	other 325	44		0.0	D	68.2	r	D		0.0		86.4		D		0.0		79.5	D		
Plastics and rubber products	326	217		3.2	r	53.7	r	43.1	r	47.2	r	0.0	52.8	r	64.4		0.0	9.6	26.0	r	
Nonmetallic mineral products	327	13		D		0.0		53.8	r	69.2		D		D		0.0		53.8	r	0.0	
Primary metals	331	56	r	D		D		92.9	r	D		0.0	98.2	r	D		0.0	94.6	r	0.0	
Fabricated metal products	332	539		19.4	r	7.6	r	73.0		45.1		D	48.2		51.3		0.0	40.2	8.5	r	
Machinery	333	1,047		31.4		1.6		67.0		58.7		0.0	41.3		55.2		0.0	38.8	6.0	r	
Computer and electronic products	334	316		20.0	r	6.6	r	73.4		37.3		D	61.4		32.6		D	59.8	6.6	r	
Communications equipment	3342	8	r	D		0.0		50.0	r	D		0.0	50.0	r	D		0.0	50.0	r	0.0	
Semiconductor and other electronic components	3344	77		10.4	r	D		83.1		27.3	r	D	70.1		9.1	r	D	80.5		D	
Navigational, measuring, electromedical, and control instruments	3345	214		21.0	r	D		71.0		41.9		0.0	58.1		40.3		0.0	51.8	7.8	r	
Other computer and electronic products	other 334	16		33.4	r	0.0		66.6	r	D		0.0	81.3		D		0.0	81.3		0.0	
Electrical equipment, appliances, and components	335	91		23.1		D		74.7		35.6		0.0	64.4		36.6		0.0	53.7		9.7	r
Transportation equipment	336	149		5.4		22.1	r	72.5		35.4	r	0.0	64.6	r	33.8	r	0.0	50.0	r	16.2	r
Automobiles, bodies, trailers, and parts	3361–63	121		4.1		25.8	r	70.0	r	33.6	r	0.0	66.4	r	33.1	r	0.0	49.6	r	17.4	r
Aerospace products and parts	3364	25		D		D		80.0		50.0	r	0.0	50.0	r	46.2	r	0.0	53.8	r	0.0	
Other transportation	other 336	D		0.0		0.0		D		0.0		0.0	D		0.0		0.0	D		D	
Furniture and related products	337	86	r	D		D		88.4		72.1	r	D	25.6	r	69.8	r	0.0	23.3	r	D	

TABLE 134

**Impact of producing robotics or goods or services with robotics 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	186	4.8	r	D	89.2	43.0	r	D	57.0	41.7	r	0.0	48.2	10.1	r			
Medical equipment and supplies	3391	157	3.8	r	D	88.5	48.4	r	D	50.3	r	48.7	r	0.0	41.6	r	9.7	r	
Other miscellaneous manufacturing	3399	30	D		0.0	93.3	D		0.0	93.3	D		0.0	76.7	D				
Nonmanufacturing industries	11, 21–23, 42–81	12,076	15.3		4.6	80.1	26.9		2.8	70.3	24.2		1.7	r	44.0	30.0			
Agriculture, forestry, fishing, and hunting	11	0	0.0		0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0			
Mining, extraction, and support activities	21	D	0.0		0.0	D	D		0.0	D	D		0.0	D	0.0	0.0			
Utilities	22	D	0.0		0.0	D	D		0.0	D	D		0.0	D	0.0	0.0			
Construction	23	744	17.5	r	D	77.3	26.6		D	62.2	29.7		D	23.9	41.0				
Wholesale trade	42	2,288	9.9		2.5	r	87.6	20.7		0.4	r	78.9	18.3		0.0	52.7	29.0		
Retail trade	44–45	1,725	17.6		11.8		70.6	21.7		D	74.5	11.3	r	D	51.8	34.5			
Transportation and warehousing	48–49	69	r	15.9	r	D	78.3	r	24.6	r	0.0	75.4	r	15.9	r	0.0	D	78.3	r
Information	51	332	24.1	r	D	73.8	46.1	r	0.0	53.9	34.3	r	D	59.6	5.7				
Publishing	511	63	57.1	r	D	34.9	r	65.6	r	0.0	34.4	r	65.6	r	0.0	34.4	r	0.0	
Newspaper, periodical, book, and directory publishers	5111	D	D		0.0	0.0	D		0.0	0.0	D		0.0	0.0	0.0	0.0			
Software publishers	5112	59	54.2	r	D	37.3	r	63.3	r	0.0	36.7	r	63.3	r	0.0	36.7	r	0.0	
Telecommunications	517	14	r	D		0.0	D	D		0.0	D	D		D	D	0.0			
Data processing, hosting, and related services	518	54	56.4		0.0	43.6	r	56.4		0.0	43.6	27.3	r	0.0	72.7	0.0			
Other information	other 51	201	r	4.0		0.0	96.0	37.1	r	0.0	62.9	r	25.2	r	0.0	65.3	r	9.4	r
Finance and insurance	52	178	30.3	r	D	69.7	30.5	r	0.0	69.5	29.8	r	0.0	48.9	r	D			
Real estate and rental and leasing	53	183	r	D		0.0	77.0	D		0.0	77.0	D		0.0	77.0	0.0			
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0.0		0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0			
Other real estate and rental and leasing	other 53	183	r	D		0.0	77.0	D		0.0	77.0	D		0.0	77.0	0.0			
Professional, scientific, and technical services	54	2,729	18.8		1.5	79.7	34.2		0.6	r	65.2	35.8		D	50.2	13.9			
Legal services	5411	D	0.0		0.0	D	0.0		0.0	D	0.0		0.0	0.0	0.0	D			
Accounting, tax preparation, bookkeeping, and payroll services	5412	5	D		0.0	D	D		0.0	D	D		0.0	D	0.0				
Architectural, engineering, and related services	5413	1,314	19.2		2.1	r	78.7	26.8		D	72.2	31.9		D	63.3	4.6	r		
Specialized design services	5414	5	0.0		D		D	0.0		D	D	0.0		0.0	100.0	0.0			
Computer systems design and related services	5415	783	19.2		D	80.2	31.6		0.0	68.4	26.6		0.0	51.2	22.2				
Management, scientific, and technical consulting services	5416	321	12.8	r	D	86.9	65.0		0.0	35.0	r	68.8		0.0	21.2	r	D		
Scientific research and development services	5417	159	34.6		D	62.3	53.5		D	44.7	57.2		D	37.1	4.4	r			
Advertising, public relations, and related services	5418	12	D		0.0	75.0	66.7		0.0	33.3	r	D		0.0	D	D			
Other professional, scientific, and technical services	5419	79	r	D		0.0	D	D		0.0	D	D		0.0	0.0	D			

TABLE 134

**Impact of producing robotics or goods or services with robotics 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	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Administrative and support and waste management and remediation services	56	772	19.6	0.0	80.4	17.7	r	0.0	82.3	7.4	r	0.0	40.5	52.1
Educational services	61	170	r	0.0	0.0	100.0	D	0.0	75.9	0.0	0.0	50.6	r	D
Health care and social assistance	62	1,188	15.0	0.0	85.0	42.6	0.0	57.4	32.3	0.0	29.6	38.2		
Health care services	621–23	1,146	15.5	0.0	84.5	40.5	0.0	59.5	29.8	0.0	30.6	39.5		
Social assistance	624	D	0.0	0.0	D	D	0.0	0.0	D	0.0	0.0	0.0		
Arts, entertainment, and recreation	71	179	r	0.0	0.0	100.0	D	0.0	74.3	D	0.0	D	0.0	
Accommodation and food services	72	754	D	22.0	r	64.5	D	22.0	64.5	21.1	D	D	49.1	
Other services	81	757	D	D	87.1	21.0	0.0	79.0	27.1	0.0	38.2	34.7		

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

TABLE 135

## Impact of producing robotics or goods or services with robotics 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	15,043	13.0	4.3	56.3	26.4	11.6	3.3	66.1	19.0	9.4	3.7	66.4	20.5	10.6	2.1	65.4	21.9								
Manufacturing industries	31–33	2,968	15.5	11.9	64.8	7.8	16.0	1.4	75.4	7.2	14.1	1.0	77.7	7.2	17.7	1.4	72.5	8.4								
Food	311	50	12.0	r	D	50.0	r	D	D	0.0	60.0	r	D	D	54.0	r	D	10.0	r	0.0	60.0	r	D			
Beverage and tobacco products	312	9	D	D	0.0	D	D	0.0	44.4	r	D	0.0	0.0	66.7	r	D	0.0	D	66.7	r	D					
Textile, apparel, and leather products	313–16	17	r	D	D	D	D	0.0	D	64.7	r	0.0	D	D	D	0.0	0.0	D	64.7	r	0.0					
Wood products	321	72	r	D	D	29.2	r	D	D	0.0	86.1	D	D	0.0	93.1	D	D	0.0	86.1	D						
Paper	322	11	0.0	D	81.8	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0								
Printing and related support activities	323	56	D	D	76.8	0.0	12.5	r	0.0	60.7	r	D	12.5	r	0.0	87.5	0.0	12.5	r	D	50.0	D				
Petroleum and coal products	324	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0						
Chemicals	325	49	0.0	D	57.1	r	D	D	0.0	87.8	D	D	0.0	87.8	D	D	0.0	87.8	D							
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0						
Pharmaceuticals and medicines	3254	D	0.0	0.0	D	D	D	0.0	D	0.0	D	0.0	D	0.0	D	0.0	D	0.0	D	0.0						
Soap, cleaning compound, and toilet preparation manufacturing	3256	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0						
Other chemicals	other 325	44	0.0	D	56.8	r	D	0.0	0.0	90.9	D	0.0	0.0	90.9	D	0.0	0.0	90.9	D							
Plastics and rubber products	326	217	4.6	r	53.7	r	41.7	r	0.0	52.1	r	D	46.5	r	0.0	28.6	r	D	71.4	0.0	53.0	r	D	45.2	r	D
Nonmetallic mineral products	327	13	D	0.0	53.8	r	0.0	D	0.0	53.8	r	0.0	D	0.0	53.8	r	0.0	D	0.0	53.8	r	0.0				
Primary metals	331	56	r	D	D	92.9	r	0.0	D	0.0	98.2	r	0.0	D	0.0	98.2	r	0.0	D	0.0	98.2	r	0.0			



TABLE 135

**Impact of producing robotics or goods or services with robotics 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															
Fabricated metal products	332	539	18.7	r	15.5	r	63.4	2.4	r	1.7	r	D	88.7	8.5	r	D	D	90.9	7.2	r	16.9	r	D	75.1	7.2	r							
Machinery	333	1,047	23.6		1.0		65.1	10.3		23.5		1.0	r	68.9	6.6	r	27.2	D	65.8	6.8	r	23.3		1.0	r	69.6	6.2	r					
Computer and electronic products	334	316	10.1		D		75.6	10.8	r	13.3	r	D	82.3	2.8	r	4.4		D	82.6	11.7	r	5.4		D	80.1	13.0	r						
Communications equipment	3342	8	r	D		0.0		50.0	r	0.0		0.0		0.0		0.0		0.0	75.0	D		0.0		0.0		100.0	0.0						
Semiconductor and other electronic components	3344	77		9.1	r	D		80.5		6.5		3.9		D		87.0	D	9.1	r	0.0		80.5		10.4	r	D		88.3	D				
Navigational, measuring, electromedical, and control instruments	3345	214		8.4		D		74.8		13.1	r	17.8	r	D		79.4	D	2.8		D		83.6		D		6.5		D		76.2	16.8	r	
Other computer and electronic products	other 334	16		D		0.0		87.5		0.0		0.0		0.0		87.5	D	0.0		0.0		100.0		0.0		0.0		0.0		87.5	D		
Electrical equipment, appliances, and components	335	91		16.5	r	D		56.0		24.2		27.2	r	0.0		59.7	13.1	r	16.5	r	0.0		59.3		24.2		20.9		0.0		56.0	23.1	
Transportation equipment	336	149		5.4		22.2	r	68.9		3.4	r	4.7		D		92.6	D	6.0	r	D		92.6		D		3.4		D		92.6	D		
Automobiles, bodies, trailers, and parts	3361–63	121		4.1		25.6	r	68.6	r	D		3.3		D		91.7	D	6.6	r	D		91.7		D		D		D		92.6	D		
Aerospace products and parts	3364	25		D		D		64.0		D		D		0.0		92.0	0.0	D		0.0		92.0		0.0		D		0.0		92.0	0.0		
Other transportation	other 336	D		0.0		0.0		D		0.0		0.0		0.0		D	0.0	0.0		0.0		D		0.0		0.0		0.0		D	0.0		
Furniture and related products	337	86	r	D		D		87.2		D		D		0.0		98.8	0.0	0.0		0.0		100.0		0.0		D		0.0		93.0	0.0		
Miscellaneous	339	186		7.5	r	D		78.5		9.7	r	4.7	r	6.9	r	71.8	16.5	r	3.2		D		81.7		10.8	r	4.8	r	D		74.2	16.7	r
Medical equipment and supplies	3391	157		D		D		77.7		11.5	r	D		D		71.3	19.7	r	D		D		79.0		12.7	r	D		D		72.6	19.7	r
Other miscellaneous manufacturing	3399	30		D		0.0		76.7		0.0		D		D		80.0	0.0	D		0.0		93.3		0.0		D		0.0		86.7	0.0		



TABLE 135

**Impact of producing robotics or goods or services with robotics 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								
Other real estate and rental and leasing	other 53	183	r	D	0.0	D	D	D	0.0	D	D	0.0	0.0	77.0	D	0.0	0.0	77.0	D							
Professional, scientific, and technical services	54	2,729		11.9	0.5	59.5	28.1	8.4	2.2	r	74.4	15.1	5.9	0.4	r	74.9	18.8	8.8	0.9	r	75.1	15.2				
Legal services	5411	D		0.0	0.0	0.0	D	0.0	0.0	0.0	D	0.0	0.0	0.0	D	0.0	0.0	0.0	0.0	D						
Accounting, tax preparation, bookkeeping, and payroll services	5412	5		0.0	0.0	D	D	0.0	0.0	D	D	D	0.0	D	0.0	D	0.0	D	0.0	D	0.0					
Architectural, engineering, and related services	5413	1,314		12.2	D	67.8	19.6	2.1	D	85.5	12.2	5.8	r	D	87.1	6.9	5.9	D	89.9	4.1						
Specialized design services	5414	5		0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0						
Computer systems design and related services	5415	783		12.3	D	50.7	36.8	10.7	r	D	72.5	16.3	3.8	r	D	64.0	32.1	12.9	r	D	63.1	23.5				
Management, scientific, and technical consulting services	5416	321		11.5	r	D	60.1	28.3	20.2	r	D	57.3	11.2	r	5.3	r	0.0	68.5	26.2	r	1.6	r	D	69.8	28.0	r
Scientific research and development services	5417	159		13.2	D	51.6	34.0	25.0	10.6	r	57.5	6.9	r	15.1	D	73.6	8.2	26.0	10.8	r	54.4	8.9				
Advertising, public relations, and related services	5418	12		D	0.0	66.7	D	D	0.0	50.0	r	D	D	0.0	50.0	r	D	D	0.0	50.0	r	D				
Other professional, scientific, and technical services	5419	79	r	D	0.0	D	D	D	0.0	D	D	D	0.0	D	D	D	0.0	D	0.0	D	D					
Management of companies and enterprises	55	0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Administrative and support and waste management and remediation services	56	772		19.6	0.0	57.5	22.9	7.4	r	0.0	50.9	41.7	7.4	r	0.0	50.9	41.7	12.7	r	0.0	40.4	46.8				

TABLE 135

**Impact of producing robotics or goods or services with robotics 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						
Educational services	61	170	r	0.0	0.0	50.6	r	D	0.0	0.0	50.6	r	D	0.0	0.0	50.6	r	D	0.0	0.0	50.6	r	D	
Health care and social assistance	62	1,188		11.4	0.0	60.6		28.0	15.0	0.0	64.3		20.7	11.6	r	0.0	64.2		24.2	11.6	r	0.0	57.3	31.1
Health care services	621–23	1,146		11.9	0.0	59.1		29.0	15.5	0.0	63.0		21.5	12.0	r	0.0	66.4		21.6	12.0	r	0.0	55.8	32.2
Social assistance	624	D		0.0	0.0	D		0.0	0.0	0.0	D		0.0	0.0		0.0	D		0.0	0.0		D	0.0	
Arts, entertainment, and recreation	71	179	r	D	0.0	76.5		0.0	0.0	0.0	76.5		D	0.0		0.0	76.5		D	0.0		0.0	76.5	D
Accommodation and food services	72	754		26.9	D	23.1	r	34.6	20.3	29.7	22.3		27.7	r	D	28.8	D		42.3	D		D	29.7	41.4
Other services	81	757		0.0	0.0	70.8		29.2	D	0.0	63.4		29.2	0.0		0.0	70.8		29.2	0.0		0.0	64.9	35.1

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

TABLE 136

**Motivations for companies producing specialized equipment or goods or services with specialized equipment, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To upgrade goods or services	To expand the range of goods or services	To enter new markets or adapt existing products to new markets	To increase or maintain market share	To adopt standards and accreditation	Some other reason
All industries	11, 21–23, 31–33, 42–81	108,525	52.5	44.9	25.5	31.2	14.8	19.4
Manufacturing industries	31–33	13,962	53.0	51.2	34.6	43.1	11.6	14.3
Food	311	535	41.9	32.1	9.7	16.6	11.8	24.3
Beverage and tobacco products	312	108	35.2	66.7	19.4	22.2	8.3 r	13.9
Textile, apparel, and leather products	313–16	273	60.4	30.8	10.6 r	14.3	9.9 r	22.7
Wood products	321	278	74.8	48.6	14.4	28.1	3.2 r	11.2 r
Paper	322	68	32.4 r	73.5	52.9 r	58.8 r	D	4.4
Printing and related support activities	323	858	55.5	42.8	37.9	37.5	6.3	13.1 r
Petroleum and coal products	324	16 r	100.0	D	D	D	D	0.0
Chemicals	325	384	52.3	42.7	37.2	58.1	21.4 r	13.5 r
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	47 r	D	D	D	D	D	D
Pharmaceuticals and medicines	3254	77	48.1	37.7	32.5	45.5	15.6 r	13.0 r
Soap, cleaning compound, and toilet preparation manufacturing	3256	55	60.0	47.3	21.8 r	23.6 r	20.0 r	D
Other chemicals	other 325	206	42.2	31.1	30.1	64.1	6.8 r	18.0 r
Plastics and rubber products	326	565	49.2	49.9	50.3	41.6	14.0 r	14.2 r
Nonmetallic mineral products	327	178	57.3	56.2	27.5 r	43.3	D	14.0 r
Primary metals	331	114	40.4 r	16.7 r	16.7 r	20.2 r	D	7.0 r
Fabricated metal products	332	3,053	54.0	58.9	35.5	43.2	11.2	16.1
Machinery	333	3,101	48.8	47.1	36.4	53.8	9.4	13.5
Computer and electronic products	334	1,812	50.2	58.8	45.0	47.5	8.8	13.3
Communications equipment	3342	228	46.5	62.7	45.2	64.0	6.6 r	12.3 r
Semiconductor and other electronic components	3344	319	43.6	59.2	33.9	43.3	11.6	19.7
Navigational, measuring, electromedical, and control instruments	3345	1,109	52.0	60.2	48.2	42.8	9.2	11.7
Other computer and electronic products	other 334	157	56.1	42.0	45.9	66.2	2.5 r	12.7 r
Electrical equipment, appliances, and components	335	419	57.0	53.2	43.9	55.1	11.0	8.6
Transportation equipment	336	493	42.6	41.8	18.9	28.2	18.7	23.5 r
Automobiles, bodies, trailers, and parts	3361–63	292	35.6	43.5	14.0	17.5	4.8	32.2 r
Aerospace products and parts	3364	108	69.4	50.9	40.7 r	55.6 r	20.4 r	15.7 r
Other transportation	other 336	93	35.5 r	26.9 r	8.6 r	28.0 r	59.1	D
Furniture and related products	337	350	58.0	63.4	34.3	37.1	8.6 r	10.3 r
Miscellaneous	339	1,360	66.3	53.8	29.8	37.6	19.3	10.5 r
Medical equipment and supplies	3391	608	83.1	56.1	46.1	49.7	26.6 r	4.4
Other miscellaneous manufacturing	3399	751	52.7	52.1	16.9	27.8	13.2	15.3 r
Nonmanufacturing industries	11, 21–23, 42–81	94,562	52.5	44.0	24.2	29.5	15.2	20.2
Agriculture, forestry, fishing, and hunting	11	127 r	D	D	D	D	0.0	D
Mining, extraction, and support activities	21	345	50.4	33.0 r	2.6	19.7 r	7.2 r	21.2 r
Utilities	22	50	84.0	46.0	38.0 r	34.0	D	0.0
Construction	23	10,176	53.8	41.6	17.9	23.8	11.9	20.3
Wholesale trade	42	12,354	46.1	42.0	33.8	39.2	7.7	18.3

TABLE 136

**Motivations for companies producing specialized equipment or goods or services with specialized equipment, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	To upgrade goods or services	To expand the range of goods or services	To enter new markets or adapt existing products to new markets	To increase or maintain market share	To adopt standards and accreditation	Some other reason
Retail trade	44–45	10,704	47.9	45.7	27.0	29.4	11.6	16.1
Transportation and warehousing	48–49	1,933	42.5	23.0	16.3	19.3	20.5	35.4
Information	51	2,100	51.0	51.7	35.0	36.8	16.1	18.0
Publishing	511	370	53.8	61.4	55.7	49.5	7.8	8.6
Newspaper, periodical, book, and directory publishers	5111	89	62.9	47.2	r 55.1	53.9	r D	14.6
Software publishers	5112	280	50.7	66.1	56.1	48.2	8.9	r 6.4
Telecommunications	517	444	40.5	50.2	23.4	22.5	6.1	26.8
Data processing, hosting, and related services	518	474	57.0	57.2	41.8	47.7	16.7	24.5
Other information	other 51	809	51.4	44.9	28.2	32.1	25.1	13.7
Finance and insurance	52	1,276	51.8	30.5	28.0	47.3	19.8	17.7
Real estate and rental and leasing	53	1,485	52.1	36.4	23.0	32.6	23.0	r 28.6
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0.0	0.0	0.0	0.0	0.0	0.0
Other real estate and rental and leasing	other 53	1,485	52.1	36.4	23.0	32.6	23.0	r 28.6
Professional, scientific, and technical services	54	18,044	56.6	52.5	33.4	37.5	18.6	15.5
Legal services	5411	871	74.2	45.6	28.1	35.2	7.8	r 20.3
Accounting, tax preparation, bookkeeping, and payroll services	5412	960	48.8	35.4	13.9	r 38.4	27.3	12.8
Architectural, engineering, and related services	5413	5,304	50.5	45.9	27.2	34.0	13.5	21.9
Specialized design services	5414	407	33.9	40.5	35.1	18.4	r 23.8	27.5
Computer systems design and related services	5415	5,285	62.0	71.3	45.3	46.5	24.1	11.3
Management, scientific, and technical consulting services	5416	2,124	52.8	44.2	32.8	34.6	18.0	11.9
Scientific research and development services	5417	763	53.6	46.9	56.0	29.5	12.5	13.4
Advertising, public relations, and related services	5418	456	62.1	52.2	44.5	31.8	12.1	r 16.0
Other professional, scientific, and technical services	5419	1,871	63.3	44.8	18.3	34.9	21.8	10.9
Management of companies and enterprises	55	D	0.0	0.0	D	D	0.0	0.0
Administrative and support and waste management and remediation services	56	6,600	52.0	49.1	21.5	26.6	10.7	26.2
Educational services	61	716	55.4	63.5	58.5	33.0	37.7	D
Health care and social assistance	62	13,627	57.0	43.7	13.1	18.6	24.2	19.4
Health care services	621–23	13,627	57.0	43.7	13.1	18.6	24.2	19.4
Social assistance	624	0	0.0	0.0	0.0	0.0	0.0	0.0
Arts, entertainment, and recreation	71	1,313	48.4	51.6	25.3	32.2	14.5	r 37.7
Accommodation and food services	72	4,252	47.6	31.7	13.5	22.3	12.7	33.7
Other services	81	9,406	55.9	37.4	17.0	26.5	13.5	21.6

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

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. 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.

TABLE 137

**Impact of producing specialized equipment or goods or services with specialized equipment 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	108,525	15.8	4.1	80.1	30.9	2.0	67.1	23.6	1.2	47.3	28.0
Manufacturing industries	31–33	13,962	19.8	6.2	74.0	34.3	1.9	63.8	30.2	0.7	53.3	15.8
Food	311	535	9.7	10.7	r 79.5	12.9	9.0	r 78.0	7.5	D	35.0	50.5
Beverage and tobacco products	312	108	26.9	11.1	62.0	50.9	D	47.2	25.9	D	28.7	43.5
Textile, apparel, and leather products	313–16	273	9.9	D	84.6	25.6	D	72.5	11.4	D	54.6	31.1
Wood products	321	278	9.0	24.1	r 66.9	9.0	D	88.8	9.4	0.0	72.5	18.1
Paper	322	68	10.3	D	58.8	r 52.2	r 0.0	47.8	r 37.3	r 0.0	40.3	r 22.4
Printing and related support activities	323	858	14.8	7.8	77.4	32.2	D	64.0	19.9	D	45.6	30.9
Petroleum and coal products	324	16	r 0.0	0.0	100.0	D	0.0	D	D	0.0	D	D
Chemicals	325	384	24.4	r 10.8	64.8	34.1	3.1	r 62.8	21.6	D	63.8	13.5
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	47	r D	0.0	D	D	0.0	D	D	0.0	D	0.0
Pharmaceuticals and medicines	3254	77	15.2	r 16.5	r 68.3	29.9	r D	62.3	29.9	r D	49.4	14.3
Soap, cleaning compound, and toilet preparation manufacturing	3256	55	D	D	83.6	27.8	r 0.0	72.2	37.0	0.0	37.0	25.9
Other chemicals	other 325	206	15.9	r 13.0	r 71.0	23.8	D	73.8	18.2	0.0	69.6	12.2
Plastics and rubber products	326	565	12.0	r 9.7	r 78.3	24.8	D	74.5	15.6	D	74.2	8.7
Nonmetallic mineral products	327	178	19.7	D	76.4	24.2	r D	72.5	18.3	0.0	41.7	40.0
Primary metals	331	114	14.0	r D	86.0	13.0	0.0	87.0	6.9	0.0	81.8	11.3
Fabricated metal products	332	3,053	22.7	5.6	r 71.8	38.7	2.2	r 59.1	38.3	D	48.9	12.7
Machinery	333	3,101	26.0	5.3	68.7	39.1	D	59.3	33.7	0.0	57.7	8.6
Computer and electronic products	334	1,812	16.8	3.3	79.9	28.7	1.2	r 70.1	29.8	0.3	r 62.0	7.9
Communications equipment	3342	228	21.9	D	76.8	33.9	0.0	66.1	36.8	0.0	60.6	2.6
Semiconductor and other electronic components	3344	319	14.2	8.2	r 77.6	29.3	6.6	r 64.1	33.9	D	57.1	7.8
Navigational, measuring, electromedical, and control instruments	3345	1,109	15.9	2.6	r 81.5	27.3	D	72.5	27.4	D	64.5	8.2
Other computer and electronic products	other 334	157	21.7	D	78.3	30.4	r 0.0	69.6	29.5	r 0.0	56.6	13.8
Electrical equipment, appliances, and components	335	419	31.7	1.2	r 67.1	46.1	0.0	53.9	47.8	0.0	48.0	4.3
Transportation equipment	336	493	21.4	4.9	r 73.7	32.3	D	66.9	27.2	D	56.0	16.6
Automobiles, bodies, trailers, and parts	3361–63	292	6.5	3.4	90.1	21.9	r D	76.7	20.2	r D	56.5	r 22.6
Aerospace products and parts	3364	108	36.1	D	63.9	40.3	0.0	59.7	29.6	0.0	63.9	D
Other transportation	other 336	93	49.5	r D	38.7	r 54.3	r 0.0	45.7	r 46.2	r 0.0	47.3	r D
Furniture and related products	337	350	18.0	D	81.1	48.9	D	51.1	46.6	0.0	31.2	22.2



TABLE 137

**Impact of producing specialized equipment or goods or services with specialized equipment 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	1,360	14.0	6.9	79.1	35.8	D	64.0	32.3	0.0	45.8	21.8	
Medical equipment and supplies	3391	608	11.2	r 13.2	r 75.6	48.5	D	51.2	49.0	0.0	32.7	18.3	r
Other miscellaneous manufacturing	3399	751	16.4	r 1.9	r 81.7	25.4	0.0	74.6	18.9	0.0	56.6	24.5	
Nonmanufacturing industries	11, 21–23, 42–81	94,562	15.2	3.8	81.0	30.4	2.0	67.6	22.6	1.3	46.4	29.8	
Agriculture, forestry, fishing, and hunting	11	127	r D	0.0	D	D	0.0	100.0	D	0.0	0.0	100.0	
Mining, extraction, and support activities	21	345	8.4	r D	91.3	34.4	0.0	65.6	27.9	0.0	52.4	19.8	r
Utilities	22	50	26.5	0.0	73.5	40.8	r 0.0	59.2	35.3	r 0.0	41.2	r 23.5	r
Construction	23	10,176	19.3	3.1	77.6	35.2	1.4	r 63.4	23.3	1.5	r 46.6	28.7	
Wholesale trade	42	12,354	13.9	4.7	81.4	26.7	1.4	71.9	22.6	0.8	r 49.1	27.5	
Retail trade	44–45	10,704	13.3	3.2	83.5	25.4	2.0	72.6	17.2	1.9	49.0	32.0	
Transportation and warehousing	48–49	1,933	18.6	6.9	r 74.5	20.9	D	78.0	6.7	r D	48.0	44.9	
Information	51	2,100	19.8	2.2	78.0	38.2	1.6	r 60.2	29.4	D	48.8	21.0	
Publishing	511	370	30.2	0.0	69.8	37.8	D	62.2	34.7	0.0	50.8	14.5	
Newspaper, periodical, book, and directory publishers	5111	89	9.1	0.0	90.9	19.1	D	78.7	14.9	0.0	56.3	28.7	r
Software publishers	5112	280	36.7	0.0	63.3	43.8	0.0	56.2	40.8	0.0	49.3	9.9	
Telecommunications	517	444	18.7	r D	80.9	34.0	D	65.8	30.2	0.0	40.8	29.1	
Data processing, hosting, and related services	518	474	16.0	6.3	r 77.7	38.4	D	60.8	30.9	0.0	56.7	12.4	
Other information	other 51	809	17.7	r 1.4	r 80.9	40.8	3.1	r 56.1	25.7	r D	48.0	24.6	
Finance and insurance	52	1,276	16.8	D	77.4	23.7	D	73.4	23.7	D	32.4	41.1	
Real estate and rental and leasing	53	1,485	12.4	D	84.0	21.9	D	77.4	15.2	r 0.0	46.6	38.1	
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other real estate and rental and leasing	other 53	1,485	12.4	D	84.0	21.9	D	77.4	15.2	r 0.0	46.6	38.1	
Professional, scientific, and technical services	54	18,044	17.2	3.4	79.4	34.1	1.4	64.5	32.6	0.5	r 50.5	16.4	
Legal services	5411	871	25.3	D	68.2	37.7	D	57.9	34.3	0.0	21.0	44.7	
Accounting, tax preparation, bookkeeping, and payroll services	5412	960	15.1	D	78.9	27.2	D	72.4	25.9	D	48.9	21.3	
Architectural, engineering, and related services	5413	5,304	11.2	3.2	85.6	27.4	2.7	69.9	31.7	0.7	r 60.2	7.4	
Specialized design services	5414	407	D	D	87.0	29.7	0.0	70.3	25.4	r 0.0	47.3	27.4	
Computer systems design and related services	5415	5,285	20.2	1.8	r 78.0	34.3	0.5	r 65.2	33.2	D	51.7	15.0	
Management, scientific, and technical consulting services	5416	2,124	22.2	5.9	r 71.9	47.3	D	50.7	44.8	D	40.3	14.6	
Scientific research and development services	5417	763	27.0	2.1	r 70.9	42.9	0.0	57.1	44.8	0.0	50.4	4.8	
Advertising, public relations, and related services	5418	456	23.7	D	74.3	30.6	0.0	69.4	24.1	0.0	44.1	31.8	
Other professional, scientific, and technical services	5419	1,871	12.7	D	83.6	37.3	0.0	62.7	21.2	0.0	47.6	31.2	

TABLE 137

**Impact of producing specialized equipment or goods or services with specialized equipment 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	D	D	0.0	D	D	0.0	D	D	0.0	D	0.0	
Administrative and support and waste management and remediation services	56	6,600	17.8	3.4	78.8	28.8	2.1	r 69.1	14.6	D	41.3	42.9	
Educational services	61	716	12.0	r 0.0	88.0	28.1	0.0	71.9	14.2	r 0.0	47.6	38.3	
Health care and social assistance	62	13,627	10.7	2.6	86.7	34.0	1.9	64.1	24.6	1.3	45.6	28.5	
Health care services	621–23	13,627	10.7	2.6	86.7	34.0	1.9	64.1	24.6	1.3	45.6	28.5	
Social assistance	624	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Arts, entertainment, and recreation	71	1,313	10.4	r D	86.3	27.2	D	69.6	13.0	D	39.9	43.9	
Accommodation and food services	72	4,252	20.6	9.7	69.7	24.1	7.5	68.4	11.8	4.9	33.9	49.3	
Other services	81	9,406	12.0	4.3	83.7	30.2	3.2	66.6	20.5	1.1	r 44.7	33.7	

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

TABLE 138

## Impact of producing specialized equipment or goods or services with specialized equipment 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	108,525	11.4	2.8	58.8	27.0	8.3	2.2	69.4	20.1	7.2	1.4	72.0	19.4	8.7	2.5	68.4	20.4	
Manufacturing industries	31–33	13,962	16.3	6.0	70.3	7.4	10.9	2.4	78.8	7.9	10.1	1.4	80.3	8.2	10.8	2.8	75.5	10.9	
Food	311	535	9.2	9.5	r 73.9	7.3	2.4	r 9.5	r 78.9	9.2	6.2	r 9.0	r 75.8	9.0	5.0	r 7.5	r 75.8	11.7	
Beverage and tobacco products	312	108	30.6	7.4	50.9	11.1	r 27.8	r D	52.8	17.6	r 19.4	r D	54.6	22.2	r 28.7	r D	44.4	24.1	r
Textile, apparel, and leather products	313–16	273	10.3	D	81.0	6.2	r D	D	73.3	21.2	4.8	r D	74.0	19.4	6.2	r D	61.9	26.7	r
Wood products	321	278	7.6	42.4	48.2	D	4.0	r D	87.8	5.8	r 3.6	D	91.4	2.5	r 4.0	D	62.2	26.3	r
Paper	322	68	7.4	D	57.4	r D	5.9	0.0	88.2	D	D	0.0	89.7	D	D	0.0	91.2	D	
Printing and related support activities	323	858	16.0	8.3	74.9	D	11.9	r 0.0	84.3	3.8	r 8.9	r D	83.4	5.7	10.4	r D	82.2	6.8	
Petroleum and coal products	324	16	r 0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	
Chemicals	325	384	23.2	r 10.3	62.3	4.2	4.4	4.4	85.2	6.0	16.4	r 2.6	r 76.3	4.7	r 5.5	3.4	86.5	4.7	
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	47	r D	0.0	0.0	D	0.0	0.0	D	D	D	0.0	D	0.0	0.0	0.0	100.0	r 0.0	
Pharmaceuticals and medicines	3254	77	11.7	r 19.5	r 61.0	D	14.3	r 11.7	r 70.1	D	6.5	13.0	r 76.6	D	13.6	r 11.1	r 62.9	12.4	r
Soap, cleaning compound, and toilet preparation manufacturing	3256	55	D	D	78.2	D	0.0	0.0	85.5	D	D	0.0	67.3	23.6	r 0.0	0.0	94.5	D	
Other chemicals	other 325	206	15.5	r 11.7	r 72.8	D	3.4	D	88.3	4.9	r 5.3	0.0	94.7	D	5.3	r D	90.3	2.9	r
Plastics and rubber products	326	565	8.3	r 5.0	r 83.9	D	6.4	1.9	90.8	D	6.0	r 1.1	r 89.4	D	7.6	r D	85.3	5.8	r
Nonmetallic mineral products	327	178	14.5	r D	79.9	5.6	r 10.1	D	53.9	34.3	7.3	D	66.5	26.2	12.4	r D	58.4	29.2	
Primary metals	331	114	14.0	r D	80.7	D	5.4	r 0.0	86.6	8.0	r 9.6	r 0.0	86.0	D	9.6	r D	83.3	4.4	r

TABLE 138

**Impact of producing specialized equipment or goods or services with specialized equipment 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								
Fabricated metal products	332	3,053	20.2	5.5	r	71.2	3.1	10.2	2.6	r	82.6	4.6	13.7	0.6	80.0	5.7	15.1	4.3	r	71.5	9.1					
Machinery	333	3,101	20.6	5.1	r	63.8	10.5	15.1	2.3	r	76.6	6.0	14.1	0.6	r	79.4	5.9	12.9	1.9	r	77.3	7.9				
Computer and electronic products	334	1,812	11.5	3.9		71.4	13.2	11.3	3.0		77.8	7.9	5.1	2.3	r	80.2	12.4	8.6	2.3		76.4	12.7				
Communications equipment	3342	228	14.9	D		62.7	14.5	14.9	r	0.0	78.1	7.0	r	2.6	0.0	89.9	7.5	r	12.7	r	D	74.1	12.3			
Semiconductor and other electronic components	3344	319	9.4	7.2	r	69.8	13.5	r	6.9	7.5	r	75.5	10.0	r	3.1	6.0	r	78.3	12.5	r	5.3	3.1	r	80.8	10.7	
Navigational, measuring, electromedical, and control instruments	3345	1,109	11.2	2.4	r	74.7	11.7	12.5	2.6	r	78.3	6.6	6.7	1.8	r	78.2	13.3	8.9	2.5	r	75.7	12.9				
Other computer and electronic products	other 334	157	12.7	r	D	64.3	22.9	4.5	0.0	79.7	15.8	r	D	D	82.8	14.0	r	7.0	0.0	74.5	18.5	r				
Electrical equipment, appliances, and components	335	419	24.6	1.2	r	62.5	11.7	15.5	D	79.7	4.3	9.1	D	84.0	6.7	13.4	D	77.8	7.9							
Transportation equipment	336	493	18.6	2.8		66.0	12.5	r	15.3	r	2.2	67.2	15.3	r	15.9	r	1.4	r	70.1	12.5	r	15.3	r	2.0	69.1	13.5
Automobiles, bodies, trailers, and parts	3361–63	292	4.8	3.8		73.3	D	7.5	3.8	69.5	19.2	r	8.2	2.4	r	70.2	19.2	r	5.1	3.1	71.1	20.8	r			
Aerospace products and parts	3364	108	27.8	D	70.4	0.0	18.3	r	0.0	81.7	0.0	7.3	r	0.0	92.7	0.0	13.9	r	D	86.1	0.0					
Other transportation	other 336	93	49.5	r	0.0	40.9	r	D	D	0.0	44.1	r	D	D	0.0	44.1	r	D	D	0.0	44.1	r	D			
Furniture and related products	337	350	16.9	D	81.4	D	9.7	r	D	83.7	5.1	r	10.3	r	D	84.3	4.3	r	5.7	r	0.0	86.4	7.9			
Miscellaneous	339	1,360	8.2	5.7	r	76.0	10.1	8.6	1.3	72.6	17.5	2.5	0.7	r	83.3	13.5	4.6	r	2.5	75.9	17.0					
Medical equipment and supplies	3391	608	5.4	12.0	r	79.1	3.5	4.3	2.3	r	76.5	16.9	3.8	D	89.5	4.9	3.1	5.3	76.1	15.5						
Other miscellaneous manufacturing	3399	751	10.4	r	D	73.5	15.8	12.0	r	D	69.6	18.1	1.5	r	D	77.9	20.6	5.6	r	D	75.8	18.4				



TABLE 138

**Impact of producing specialized equipment or goods or services with specialized equipment 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								
Other real estate and rental and leasing	other 53	1,485	6.0	r	D	56.9	36.4	6.8	r	0.0	64.6	28.6	3.0	r	0.0	71.3	25.7	5.9	r	0.0	71.3	22.8				
Professional, scientific, and technical services	54	18,044	11.3		1.5	56.3	30.9	9.4		2.3	68.9	19.4	9.0		1.4	70.1	19.5	9.8		2.7	68.3	19.2				
Legal services	5411	871	13.1	r	0.0	28.5	58.4	13.7		D	29.4	50.4	19.4		0.0	34.8	45.7	15.0		D	43.6	34.7				
Accounting, tax preparation, bookkeeping, and payroll services	5412	960	9.5	r	D	62.4	24.3	D		6.4	r	65.3	22.7	D		D	74.1	21.3	D		D	66.4	22.1			
Architectural, engineering, and related services	5413	5,304	8.8		1.6	r	63.7	25.9	5.2		1.7	r	78.2	14.9	5.1		0.7	r	83.0	11.2	7.7		1.6	r	77.0	13.7
Specialized design services	5414	407	0.0		D	42.5	56.8	D		D	62.4	24.6	r	D		0.0	61.7	26.0	D		0.0	72.5	15.2	r		
Computer systems design and related services	5415	5,285	13.5		D	54.7	31.7	9.4		0.7	r	71.9	18.0	9.5		1.8	r	68.8	19.9	8.2		2.6	r	69.8	19.4	
Management, scientific, and technical consulting services	5416	2,124	10.8	r	3.7	r	51.9	33.6	16.5		3.5	r	63.6	16.4	14.8		3.5	r	56.6	25.1	15.0	r	3.5	r	55.0	26.5
Scientific research and development services	5417	763	15.9		2.0	55.1	27.0	19.4		3.0	r	68.6	9.0	14.2	r	D	74.8	10.9	17.3		2.8	r	68.2	11.7		
Advertising, public relations, and related services	5418	456	10.4		0.0	63.0	26.6	11.2	r	D	53.1	33.6	14.7	r	0.0	64.0	21.3	20.3	r	0.0	58.5	21.2				
Other professional, scientific, and technical services	5419	1,871	13.3		D	56.5	27.6	8.6	r	D	65.5	23.3	7.6	r	0.0	68.1	24.3	7.7	r	D	69.1	20.6				
Management of companies and enterprises	55	D	D		0.0	D	0.0	0.0		0.0	D	0.0	0.0		0.0	D	0.0	0.0		0.0	D	0.0	0.0			
Administrative and support and waste management and remediation services	56	6,600	14.7		1.4	r	55.8	28.1	8.2		1.3	r	63.5	27.0	7.0		D	68.1	24.1	6.7		2.1	r	67.1	24.1	

TABLE 138

**Impact of producing specialized equipment or goods or services with specialized equipment 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		
Educational services	61	716	D	0.0	62.4	32.0	r	D	0.0	88.0	D	8.2	r	0.0	79.9	D	D	0.0	88.0	D
Health care and social assistance	62	13,627	8.4	1.2	r	58.6	31.8	7.0	2.0	68.2	22.8	6.2	0.9	71.4	21.5	6.7	1.0	71.0	21.3	
Health care services	621–23	13,627	8.4	1.2	r	58.6	31.8	7.0	2.0	68.2	22.8	6.2	0.9	71.4	21.5	6.7	1.0	71.0	21.3	
Social assistance	624	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Arts, entertainment, and recreation	71	1,313	D	D	59.1	37.6	D	D	63.6	29.7	D	D	66.3	30.5	10.4	r	D	60.5	25.8	
Accommodation and food services	72	4,252	15.2	9.7	46.6	28.4	13.2	6.1	51.1	29.6	9.4	7.5	60.4	22.7	9.6	6.1	59.0	25.3		
Other services	81	9,406	8.2	2.6	61.4	27.8	3.4	2.3	r	71.1	23.2	3.5	D	71.7	24.3	5.5	3.2	r	64.4	26.9

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

TABLE 139

## Factors adversely affecting production of artificial intelligence or goods or services that included artificial intelligence, by industry: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
All industries	11, 21–23, 31–33, 42–81	4,805,151	5.4	1.1	0.5	0.3	0.7	0.4	0.6	0.8	48.0	43.2
Manufacturing industries	31–33	217,565	9.2	1.1	0.6	0.3	1.8	0.3	0.5	1.9	43.4	43.5
Food	311	18,250	9.2	1.1	0.4 r	0.3 r	1.0	0.3 r	0.6 r	1.4	47.2	40.5
Beverage and tobacco products	312	7,723	7.7	1.1	0.9 r	0.3	1.3	0.3	0.2	1.7	40.1	47.9
Textile, apparel, and leather products	313–16	10,554	10.0	0.6	0.4	0.2	1.6	0.1 r	0.6 r	1.5	43.5	43.0
Wood products	321	11,012	7.6	0.4	0.5 r	0.2 r	0.9	D	0.1 r	0.6 r	45.2	43.4
Paper	322	2,117	8.3	0.6	D	0.3 r	1.2 r	0.0	1.3 r	3.1 r	53.3	37.5
Printing and related support activities	323	20,851	8.1	0.6	0.2	0.2	0.8	0.1 r	0.4	1.0	44.1	44.9
Petroleum and coal products	324	583	8.7 r	D	D	D	0.7	4.5 r	3.8 r	0.0	41.5	52.0
Chemicals	325	7,522	9.9	1.3	0.8 r	0.6 r	2.1	0.4	0.3	2.9	41.4	44.0
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	7.3 r	1.9 r	0.0	0.0	0.0	0.0	D	D	46.5	44.2
Pharmaceuticals and medicines	3254	1,365	8.1	1.3	D	D	0.8	0.3 r	D	3.6	44.5	41.9
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	12.1	0.2	0.8 r	0.4 r	5.3	0.2	0.4	6.4	37.7	45.8
Other chemicals	other 325	3,927	9.9	1.7 r	1.1 r	0.8 r	1.5 r	0.5	0.4	1.5 r	41.1	44.0
Plastics and rubber products	326	8,087	13.0	2.0	0.7	0.2 r	4.7	0.2 r	1.1 r	4.7	40.5	40.5
Nonmetallic mineral products	327	7,749	6.8	0.5	0.3	0.3	0.8	0.3 r	0.1	1.3	48.6	42.2
Primary metals	331	2,537	9.5	1.4	1.2 r	0.3	1.3	0.4 r	0.7	1.4	39.1	45.4
Fabricated metal products	332	48,472	10.3	1.0	0.4	0.2 r	1.8	0.3	0.5	2.2	42.6	43.9
Machinery	333	18,558	8.9	1.3	1.1 r	0.2	3.6	0.3	0.7 r	1.7	43.9	42.2
Computer and electronic products	334	9,036	7.1	2.7	1.6	0.9	2.3	1.0	1.1	3.3	40.6	46.0
Communications equipment	3342	974	7.4	0.6 r	2.1 r	D	1.6 r	2.0 r	2.1 r	4.0	41.9	46.0
Semiconductor and other electronic components	3344	2,796	6.9	3.9	1.4 r	1.5 r	2.5	0.2 r	0.7	2.3	41.8	44.0
Navigational, measuring, electromedical, and control instruments	3345	3,909	7.3	2.8	1.8	0.5	2.7	1.5 r	1.1	4.4	39.5	46.7
Other computer and electronic products	other 334	1,359	6.8	1.1 r	1.1 r	0.5	1.3 r	D	0.9	1.8 r	40.5	47.8
Electrical equipment, appliances, and components	335	4,000	9.1	1.7	1.5 r	0.4	3.0 r	0.3 r	1.1	1.7	41.7	43.5
Transportation equipment	336	7,175	9.6	1.1	1.0 r	0.9 r	3.3	0.4	1.0 r	2.0	41.8	44.4
Automobiles, bodies, trailers, and parts	3361–63	4,565	10.7	1.0	1.3 r	1.2 r	4.3	0.4	1.2 r	1.8	39.9	44.7



TABLE 139

Factors adversely affecting production of artificial intelligence or goods or services that included artificial intelligence, by industry: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Aerospace products and parts	3364	985	7.7	2.3	1.1	0.5	2.3	D	1.5 r	3.8	39.4	48.4
Other transportation	other 336	1,625	7.8	0.7 r	D	0.4	0.9 r	0.5	0.0	1.6 r	48.4	41.2
Furniture and related products	337	12,647	9.2	1.0	0.4	0.2	2.2	0.1	0.4	2.0	43.1	43.0
Miscellaneous	339	20,669	8.9	1.6	0.4	0.4 r	1.3	0.4	0.3	1.7	43.0	44.3
Medical equipment and supplies	3391	8,060	10.9	1.6	0.3 r	0.1 r	0.8	0.5 r	0.2	2.3 r	42.1	43.2
Other miscellaneous manufacturing	3399	12,608	7.7	1.6 r	0.4	0.5 r	1.6 r	0.3 r	0.3 r	1.3	43.6	44.9
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	5.2	1.1	0.5	0.3	0.7	0.4	0.6	0.8	48.3	43.2
Agriculture, forestry, fishing, and hunting	11	21,606	4.0	0.4 r	D	D	D	0.5 r	0.4 r	0.7 r	54.5	38.9
Mining, extraction, and support activities	21	14,969	3.9	0.8	1.0 r	0.1	0.8 r	0.1	0.4 r	0.6	48.7	44.3
Utilities	22	2,684	4.1 r	0.7	0.2 r	0.2	0.7 r	0.2	0.6	0.7 r	49.7	43.3
Construction	23	613,110	4.5	0.4	0.3	0.2	0.5	0.2	0.3	0.5	51.9	41.2
Wholesale trade	42	257,153	6.4	1.0	0.6	0.2	0.8	0.3	0.5	0.9	47.6	42.5
Retail trade	44–45	560,952	6.6	0.6	0.5	0.2	0.6	0.2	0.4	0.8	48.8	42.2
Transportation and warehousing	48–49	152,463	6.0	0.9	0.4	0.3	0.5	0.9	0.6	0.8	47.3	42.5
Information	51	61,638	4.6	3.2	1.2	0.7	2.1	0.4	0.6	2.0	41.9	46.6
Publishing	511	17,590	5.1	3.9	1.8	0.4	2.3	0.5	0.6	2.4	39.9	48.0
Newspaper, periodical, book, and directory publishers	5111	9,761	5.0	0.8	0.4	0.1	1.0	0.4 r	0.7 r	1.1 r	45.3	46.3
Software publishers	5112	7,828	5.3	7.7	3.5	0.7	3.8	0.5 r	0.5	4.0	33.4	50.1
Telecommunications	517	7,164	6.7	1.5	0.9 r	0.9	1.3 r	0.5 r	0.8	2.0	40.9	47.3
Data processing, hosting, and related services	518	8,918	5.3	5.8	2.4	1.3	4.3	0.6	0.7	3.8	34.7	48.6
Other information	other 51	27,965	3.6	2.4	0.6	0.6	1.6	0.2	0.5	1.2	45.6	45.0
Finance and insurance	52	200,857	3.7	1.1	0.5	0.2	0.7	1.1	1.1	0.7	41.2	50.3
Real estate and rental and leasing	53	255,783	3.3	1.0	0.4	0.4	0.3	0.4	0.3	0.6	48.2	45.6
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	D	9.3 r	D	D	D	0.0	0.0	10.9	36.5	46.1
Other real estate and rental and leasing	other 53	253,970	3.3	0.9	0.4	0.4	0.3	0.4	0.3	0.5	48.3	45.6
Professional, scientific, and technical services	54	695,672	4.3	2.3	0.7	0.4	1.2	0.5	0.8	1.1	45.5	45.3
Legal services	5411	152,243	3.1	1.4	0.5	0.3	0.7	0.3	0.8	0.6	50.6	42.3

TABLE 139

**Factors adversely affecting production of artificial intelligence or goods or services that included artificial intelligence, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	5.2	1.9	0.3	0.4	0.6	0.8	1.5	0.6	40.7	48.8
Architectural, engineering, and related services	5413	88,491	4.2	2.0	0.6	0.3	1.2	0.2	0.6	1.1	49.9	42.2
Specialized design services	5414	26,282	4.4	1.1	0.3 r	D	0.7	D	0.3 r	0.9	55.3	38.0
Computer systems design and related services	5415	95,950	6.0	5.9	1.7	1.0	3.1	0.8	1.4	2.9	35.1	49.8
Management, scientific, and technical consulting services	5416	132,989	3.7	2.1	0.5	0.3	1.1	0.4	0.4	1.0	45.0	46.7
Scientific research and development services	5417	9,798	4.5	4.1	1.7	1.1	2.2	0.5	1.1	2.6	43.8	43.2
Advertising, public relations, and related services	5418	27,677	4.3	1.5	0.5	0.3 r	0.9	0.2 r	0.4	1.2	47.0	45.8
Other professional, scientific, and technical services	5419	55,569	4.5	1.1	0.4	0.1 r	0.9	0.5	0.5	0.7	48.1	43.9
Management of companies and enterprises	55	2,409	D	D	D	0.0	D	0.0	0.0	0.0	38.9	57.1
Administrative and support and waste management and remediation services	56	287,807	5.4	0.8	0.4	0.3	0.6	0.3	0.6	0.8	49.3	42.5
Educational services	61	53,912	3.4	0.6	0.2 r	0.3 r	0.5	D	0.5	1.0	52.3	41.9
Health care and social assistance	62	519,556	5.4	1.5	0.5	0.3	0.6	0.8	0.9	0.8	48.9	42.1
Health care services	621–23	459,855	5.5	1.7	0.5	0.3	0.6	0.8	1.0	0.8	48.5	42.5
Social assistance	624	59,700	4.8	0.6	0.2 r	0.3 r	0.5	0.4	0.8	0.9	52.2	39.0
Arts, entertainment, and recreation	71	88,831	3.2	0.4	0.2	D	0.3	D	0.4	0.3	50.5	44.7
Accommodation and food services	72	453,059	7.0	0.9	0.6	0.3	0.6	0.3	0.5	0.8	47.9	42.2
Other services	81	345,125	5.8	0.5	0.4	0.2	0.5	0.3	0.5	0.8	49.8	41.9

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. Detail may exceed total because companies could select more than one response. 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.

TABLE 140

**Factors adversely affecting production of artificial intelligence or goods or services that included artificial intelligence, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
All companies	4,805,151	5.4	1.1	0.5	0.3	0.7	0.4	0.6	0.8	48.0	43.2
Micro companies											
1–4	2,667,724	5.2	0.9	0.5	0.3	0.7	0.4	0.5	0.8	48.6	42.6
5–9	936,576	5.9	1.1	0.6	0.3	0.7	0.4	0.6	0.9	48.5	42.5
Small companies											
10–19	579,513	5.7	1.1	0.4	0.2	0.7	0.4	0.5	0.8	46.6	44.6
20–49	402,199	5.4	1.3	0.5	0.3	0.7	0.4	0.9	0.9	47.2	44.8
Medium companies											
50–99	119,497	5.3	2.0	0.8	0.4	1.3	0.5	0.5	0.9	45.1	46.2
100–249	65,565	5.5	2.7	0.7	0.3	1.6	0.7	0.9	1.0	44.6	45.7
Large companies											
250–499	18,897	7.4	3.1	0.5	0.5 r	2.6	0.2	1.4	1.3 r	43.4	45.6
500–999	7,289	5.7 r	2.8	0.7	1.3 r	1.7	0.4	0.8	0.8	43.0	47.0
1,000–4,999	6,199	7.9 r	5.4 r	1.3	1.5	2.3	0.7	1.5	0.9	36.2	51.0
5,000–9,999	823	5.7	6.1	2.8	1.7	4.9	1.0	1.8	1.5	31.1	51.2
10,000–24,999	514	8.8	8.8	3.7	3.5	5.6	3.1	6.2	1.8	26.8	54.3
25,000 or more	358	18.4 r	13.1	4.7	5.9	10.3	2.8	4.7	3.4	27.4	40.5

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. 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.

**TABLE 141**  
**Factors adversely affecting production of cloud-based computing systems and applications or goods or services that included cloud-based computing systems and applications, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
All industries	11, 21–23, 31–33, 42–81	4,805,151	5.3	0.6	0.5	0.3	0.7	0.6	2.0	0.9	37.9	51.6
Manufacturing industries	31–33	217,565	7.7	0.7	0.6	0.3	1.5	0.4	2.5	1.7	36.0	49.5
Food	311	18,250	8.4	0.7	0.6	0.4 r	1.0	0.3 r	1.6	1.8	40.6	45.8
Beverage and tobacco products	312	7,723	7.1	0.5	0.7 r	0.2 r	1.1	0.5	1.4	2.7	30.6	56.0
Textile, apparel, and leather products	313–16	10,554	9.4	0.7 r	0.2	0.2	1.4	0.2	1.8	1.5	36.9	47.8
Wood products	321	11,012	5.7	0.3	0.5 r	0.0	0.5	D	1.2	0.5	41.3	46.5
Paper	322	2,117	7.9	D	1.4 r	0.0	1.0 r	0.0	2.2	2.6 r	44.9	42.6
Printing and related support activities	323	20,851	8.3	1.0	0.8	0.1	0.7	0.2 r	2.0	1.3	33.1	52.9
Petroleum and coal products	324	583	3.8 r	0.0	0.0	0.0	3.4 r	D	D	0.0	31.0	59.5
Chemicals	325	7,522	8.1	0.3	0.8 r	0.3	1.7 r	0.4	2.6	2.1	33.1	52.3
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	6.1 r	D	0.0	0.0	0.0	0.0	1.2	D	34.6	57.5
Pharmaceuticals and medicines	3254	1,365	5.6	0.4	D	0.5 r	0.4	0.5 r	3.6 r	3.3	35.5	49.9
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	9.4	0.2	1.3 r	0.9 r	3.2 r	0.4 r	2.8	5.7	26.3	55.8
Other chemicals	other 325	3,927	8.7	0.4	0.9 r	0.0	1.9 r	0.3	2.4	0.5	35.0	51.0
Plastics and rubber products	326	8,087	9.0	1.7	0.8	0.3 r	3.2	0.2 r	6.2	2.4	32.5	46.6
Nonmetallic mineral products	327	7,749	5.9	0.3 r	0.4 r	0.2	1.1	0.3 r	1.7	1.3	40.4	47.6
Primary metals	331	2,537	8.9	0.3	1.5 r	0.3	1.2	0.3	1.5	1.5	35.6	48.0
Fabricated metal products	332	48,472	8.5	0.7	0.3	0.4	1.0	0.4 r	2.9	1.4	36.5	49.2
Machinery	333	18,558	6.5	1.2	0.8 r	0.2	2.2	0.4 r	3.9	1.6	36.8	48.9
Computer and electronic products	334	9,036	5.6	1.4	0.9	0.2 r	2.1	1.1	5.1	3.3	30.8	52.8
Communications equipment	3342	974	4.3	1.3 r	D	0.0	3.1	D	6.2	4.6 r	27.6	54.6
Semiconductor and other electronic components	3344	2,796	4.6	2.3 r	0.9 r	0.4 r	2.4	0.9 r	5.0	2.5 r	33.8	48.9
Navigational, measuring, electromedical, and control instruments	3345	3,909	5.6	1.0 r	1.0 r	0.1	1.4	1.4 r	5.3	3.7	30.0	54.6

**TABLE 141**  
**Factors adversely affecting production of cloud-based computing systems and applications or goods or services that included cloud-based computing systems and applications, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Other computer and electronic products	other 334	1,359	8.4	1.3 r	0.7	0.0	2.9	0.0	3.4	2.6	29.0	54.1
Electrical equipment, appliances, and components	335	4,000	6.5	0.4	1.1 r	0.7	1.1	D	3.2	1.2	34.5	51.4
Transportation equipment	336	7,175	7.7	0.6	1.8	0.4	3.3	0.3	3.0	1.8	35.7	49.4
Automobiles, bodies, trailers, and parts	3361–63	4,565	8.5	0.6	2.4 r	0.4	4.6	0.3	3.2	1.7	34.2	49.7
Aerospace products and parts	3364	985	6.3	1.6	1.1 r	D	1.1	0.8 r	5.3	3.0	31.4	54.8
Other transportation	other 336	1,625	6.5	D	0.7 r	0.6 r	1.0	D	0.9	1.3 r	42.4	45.4
Furniture and related products	337	12,647	7.9	0.3	0.3	0.1	2.3	D	1.4	2.0	37.4	48.2
Miscellaneous	339	20,669	7.0	1.0	0.7	0.5 r	1.5	0.7	1.5	2.1	33.9	51.3
Medical equipment and supplies	3391	8,060	8.5	1.7 r	0.8 r	0.5 r	1.6	1.1 r	2.1	3.9	32.3	48.5
Other miscellaneous manufacturing	3399	12,608	6.0	0.6 r	0.7 r	0.4 r	1.4	0.5 r	1.1	0.9	34.9	53.0
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	5.2	0.6	0.5	0.3	0.7	0.6	1.9	0.9	38.0	51.7
Agriculture, forestry, fishing, and hunting	11	21,606	4.2	D	0.0	D	0.7	D	0.8 r	0.9	48.9	44.0
Mining, extraction, and support activities	21	14,969	3.9	0.3 r	0.3 r	0.2 r	0.7 r	0.1	1.6	0.8 r	41.6	49.7
Utilities	22	2,684	5.1	1.5 r	0.5 r	D	1.0	0.4	3.5	1.6	39.0	48.6
Construction	23	613,110	4.4	0.3	0.4	0.2	0.5	0.2	1.2	0.5	44.8	47.0
Wholesale trade	42	257,153	5.7	0.7	0.5	0.4	0.9	0.3	1.8	1.0	38.0	50.2
Retail trade	44–45	560,952	6.4	0.5	0.5	0.3	0.7	0.3	1.2	0.9	42.0	47.6
Transportation and warehousing	48–49	152,463	5.5	0.6	0.4	0.3	0.5	1.1	1.5	1.0	40.8	47.6
Information	51	61,638	4.8	1.5	0.6	0.3	1.8	0.5	2.5	2.2	23.7	63.7
Publishing	511	17,590	4.5	1.7	0.4	0.2 r	2.1	0.5	3.9	2.8	21.9	64.2
Newspaper, periodical, book, and directory publishers	5111	9,761	4.3	0.7 r	0.4	D	1.8	D	3.5	1.3 r	28.9	58.9
Software publishers	5112	7,828	4.6	2.8	0.5 r	0.4 r	2.5	1.0	4.3	4.7	13.2	70.8
Telecommunications	517	7,164	5.2	1.0	0.9	0.9	1.6	1.1	2.1	2.1	24.8	61.6
Data processing, hosting, and related services	518	8,918	4.6	1.7	1.0 r	0.3 r	3.1	0.9	4.0	2.9	12.5	72.4
Other information	other 51	27,965	5.0	1.3	0.4 r	0.3	1.2	0.2	1.2	1.7	28.1	61.2

**TABLE 141**  
**Factors adversely affecting production of cloud-based computing systems and applications or goods or services that included cloud-based computing systems and applications, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Finance and insurance	52	200,857	3.8	0.6	0.6	0.2	0.7	1.5	2.8	0.6	26.8	62.4
Real estate and rental and leasing	53	255,783	3.3	0.5	0.3	0.2	0.3	0.5	1.6	0.6	36.8	55.7
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	D	D	0.0	0.0	D	0.0	0.0	8.6	29.4	58.8
Other real estate and rental and leasing	other 53	253,970	3.3	0.5	0.3	0.2	0.3	0.5	1.7	0.5	36.8	55.7
Professional, scientific, and technical services	54	695,672	4.4	1.0	0.5	0.3	1.0	0.8	3.8	1.1	27.8	60.1
Legal services	5411	152,243	3.7	0.7	0.4	0.3	0.8	0.8	4.2	0.8	31.1	56.8
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	5.6	1.4	0.4	0.3	0.7	1.4	6.8	0.8	21.6	61.7
Architectural, engineering, and related services	5413	88,491	4.7	0.8	0.6	0.4	1.1	0.3	3.4	1.2	31.6	57.1
Specialized design services	5414	26,282	3.7	0.5	0.4	D	0.6	D	1.6	1.0	37.3	54.3
Computer systems design and related services	5415	95,950	5.4	1.6	0.7	0.7	2.0	1.1	4.0	2.2	15.1	70.4
Management, scientific, and technical consulting services	5416	132,989	3.5	0.9	0.3	0.3	0.8	0.5	1.8	1.0	31.8	59.6
Scientific research and development services	5417	9,798	4.2	0.9	0.6	0.4	1.6	1.4	4.5	2.5	32.5	54.0
Advertising, public relations, and related services	5418	27,677	3.4	0.5	0.4	0.2	0.7	0.2	1.6	1.2	29.2	62.7
Other professional, scientific, and technical services	5419	55,569	4.7	0.7	0.4	0.3	1.1	0.5	3.7	0.8	31.2	56.8
Management of companies and enterprises	55	2,409	0.0	0.0	D	0.0	D	D	0.0	0.0	32.6	65.1
Administrative and support and waste management and remediation services	56	287,807	5.1	0.4	0.4	0.2	0.4	0.3	1.4	0.8	39.8	50.9
Educational services	61	53,912	3.3	0.3	D	D	0.7	0.1	0.6	0.7	40.2	53.1
Health care and social assistance	62	519,556	6.0	1.1	0.5	0.4	0.6	1.6	2.9	1.1	34.8	52.7
Health care services	621–23	459,855	6.2	1.3	0.6	0.5	0.7	1.7	3.1	1.1	33.8	53.5

**TABLE 141**  
**Factors adversely affecting production of cloud-based computing systems and applications or goods or services that included cloud-based computing systems and applications, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology		
Social assistance	624	59,700	4.6	0.2	0.2	r	0.3	0.5	0.6	1.6	0.9	42.7	46.7	
Arts, entertainment, and recreation	71	88,831	3.2	0.4	0.2		0.1	r	0.3	D	1.4	0.7	40.9	52.8
Accommodation and food services	72	453,059	6.7	0.7	0.7		0.3		0.6	0.3	1.1	0.9	42.9	46.6
Other services	81	345,125	5.6	0.4	0.5		0.2		0.7	0.3	1.1	0.9	43.9	46.5

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. Detail may exceed total because companies could select more than one response. 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.

TABLE 142

**Factors adversely affecting production of cloud-based computing systems and applications or goods or services that included cloud-based computing systems and applications, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
All companies	4,805,151	5.3	0.6	0.5	0.3	0.7	0.6	2.0	0.9	37.9	51.6
Micro companies											
1–4	2,667,724	5.2	0.5	0.4	0.3	0.6	0.5	1.7	0.9	39.8	49.9
5–9	936,576	5.7	0.8	0.6	0.4	0.7	0.7	2.2	1.0	37.8	51.1
Small companies											
10–19	579,513	5.5	0.7	0.4	0.3	0.8	0.5	2.1	1.0	35.1	54.0
20–49	402,199	4.9	0.8	0.5	0.3	0.7	0.6	2.3	0.9	34.5	55.6
Medium companies											
50–99	119,497	4.1	0.7	0.8	0.5	1.1	0.7	2.4	1.0	30.1	59.6
100–249	65,565	5.0	1.2	0.7	0.1	1.0	0.8	2.8	1.0	28.8	60.2
Large companies											
250–499	18,897	6.1	0.5 r	0.3 r	0.2	1.5 r	0.4 r	4.1	1.2 r	26.0	61.8
500–999	7,289	3.9 r	1.0	0.5	0.9 r	1.0	0.6	4.2 r	1.3 r	28.8	59.9
1,000–4,999	6,199	6.9 r	2.0 r	0.9	0.7	1.6	1.6 r	5.6 r	2.4 r	20.7	64.4
5,000–9,999	823	3.6	2.3	1.8	1.1	3.3	1.6	4.6	0.7	20.8	61.8
10,000–24,999	514	4.9	3.1	2.1	2.7	3.7	2.7	7.4	1.9	16.9	65.8
25,000 or more	358	17.0 r	5.6	3.6	1.7	6.4	3.6	7.8	2.0	21.8	49.4

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. 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.



TABLE 143

## Factors adversely affecting production of specialized software or goods or services that included specialized software, by industry: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
All industries	11, 21–23, 31–33, 42–81	4,805,151	5.8	0.5	0.4	0.2	0.7	0.6	0.8	1.1	37.3	52.6
Manufacturing industries	31–33	217,565	9.1	0.5	0.5	0.3	2.0	0.3	0.7	2.3	32.5	53.0
Food	311	18,250	9.2	0.6	0.3 r	0.3 r	1.5	0.3 r	0.4 r	2.0	40.0	46.2
Beverage and tobacco products	312	7,723	8.9	0.6	0.6 r	0.2	1.4	0.5	0.3	2.9	29.3	55.7
Textile, apparel, and leather products	313–16	10,554	9.7	0.4 r	0.2	0.3 r	1.9	0.2	0.9 r	1.7	36.0	49.3
Wood products	321	11,012	6.9	0.4 r	D	0.1 r	1.6	0.7 r	0.8 r	1.5	39.6	47.2
Paper	322	2,117	4.8	D	D	D	1.1 r	0.0	1.3 r	3.4 r	42.8	46.6
Printing and related support activities	323	20,851	8.7	0.4	0.2	0.2	0.6	0.2	0.7	2.1	29.7	57.0
Petroleum and coal products	324	583	3.3 r	D	D	D	3.4 r	D	1.0	D	30.9	59.3
Chemicals	325	7,522	9.1	0.7 r	0.8 r	0.4 r	1.7	0.4	0.6	2.5	31.9	54.0
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	5.1 r	D	D	0.0	0.0	D	D	D	30.7	61.6
Pharmaceuticals and medicines	3254	1,365	7.3	0.4	D	D	0.8 r	0.2	1.0 r	2.8	33.5	53.1
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	13.5	0.3	D	0.8 r	4.4 r	D	0.6	6.4	27.4	53.9
Other chemicals	other 325	3,927	8.4	0.9 r	1.2 r	0.2 r	1.1	0.5	0.5	1.0	33.5	53.4
Plastics and rubber products	326	8,087	10.7	0.5	0.4	1.3 r	5.0	0.2 r	1.5 r	4.5	31.7	50.1
Nonmetallic mineral products	327	7,749	7.2	0.2	0.4	0.4	1.3	0.4 r	1.0 r	1.3	39.0	48.5
Primary metals	331	2,537	15.0	0.7	D	0.2	1.1	D	0.9 r	2.6	31.0	47.6
Fabricated metal products	332	48,472	9.9	0.4	0.5	0.1	1.9	0.2 r	0.4	2.2	31.0	54.9
Machinery	333	18,558	9.4	0.5 r	0.6	0.3	2.1	0.2 r	1.2	2.1	30.9	54.6
Computer and electronic products	334	9,036	6.2	1.2	0.5	0.2	2.6	0.5	1.0	3.1	25.6	61.1
Communications equipment	3342	974	6.2	0.5	D	D	4.0	D	1.5 r	4.4	21.1	65.3
Semiconductor and other electronic components	3344	2,796	6.0	1.9 r	1.0 r	D	3.4	D	0.5 r	2.3	30.7	54.9
Navigational, measuring, electromedical, and control instruments	3345	3,909	5.7	0.8 r	0.2	0.2	2.3	0.8 r	0.8	3.4	22.9	65.1
Other computer and electronic products	other 334	1,359	8.0	1.3 r	D	D	0.7	0.0	1.5 r	3.1	26.2	59.1
Electrical equipment, appliances, and components	335	4,000	8.9	0.1	1.0 r	0.4 r	2.6 r	D	0.8	2.2	29.9	54.9
Transportation equipment	336	7,175	8.9	0.4	1.7	0.3	3.3	0.3	0.9 r	2.8	32.4	52.6
Automobiles, bodies, trailers, and parts	3361–63	4,565	9.6	0.3	2.4 r	0.3	4.5	0.2 r	1.1 r	2.6	30.3	53.6

TABLE 143

## Factors adversely affecting production of specialized software or goods or services that included specialized software, by industry: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Aerospace products and parts	3364	985	7.6	1.3	1.0 r	0.5	1.7 r	0.6 r	0.9 r	4.8	27.8	59.4
Other transportation	other 336	1,625	8.0	D	0.0	D	1.2 r	0.3 r	0.7 r	2.3 r	41.2	45.5
Furniture and related products	337	12,647	10.9	0.1	0.6 r	0.1	3.6	0.1 r	0.3	3.2	31.3	52.1
Miscellaneous	339	20,669	8.8	0.7 r	0.3 r	0.5	1.7	0.3	0.5	2.3	30.9	53.4
Medical equipment and supplies	3391	8,060	12.5	1.7 r	0.0	0.7	1.7	0.5 r	0.7 r	3.8	29.2	49.7
Other miscellaneous manufacturing	3399	12,608	6.5	0.2 r	0.5 r	0.5 r	1.7 r	0.2	0.4	1.3	32.0	55.8
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	5.7	0.5	0.4	0.2	0.7	0.6	0.8	1.0	37.5	52.6
Agriculture, forestry, fishing, and hunting	11	21,606	5.0	D	0.6 r	D	D	D	D	0.7 r	47.8	45.5
Mining, extraction, and support activities	21	14,969	3.8	0.4 r	0.3 r	0.1 r	0.3 r	0.1 r	0.3 r	1.0 r	42.0	50.3
Utilities	22	2,684	3.2	0.7 r	0.3 r	D	0.9	0.2	1.0 r	2.2 r	37.4	55.0
Construction	23	613,110	4.8	0.4	0.3	0.2	0.6	0.2	0.4	0.6	44.6	47.3
Wholesale trade	42	257,153	6.5	0.5	0.6	0.3	1.0	0.3	0.5	1.2	38.2	50.7
Retail trade	44–45	560,952	7.1	0.4	0.4	0.3	0.6	0.3	0.5	1.1	40.6	48.8
Transportation and warehousing	48–49	152,463	5.8	0.5	0.4	0.4	0.5	1.6	0.8	1.2	39.8	47.9
Information	51	61,638	4.8	0.8	0.6	0.3	1.8	0.4	0.7	2.2	24.4	64.9
Publishing	511	17,590	5.4	0.5	0.2	0.2	1.4	0.4	0.5	2.9	22.2	67.4
Newspaper, periodical, book, and directory publishers	5111	9,761	6.2	0.2	0.2 r	D	0.8	D	0.5 r	2.1	29.4	60.6
Software publishers	5112	7,828	4.4	0.8 r	0.2	0.3	2.2	0.7	0.6	3.9	13.3	75.8
Telecommunications	517	7,164	7.0	1.0	1.5	0.5 r	2.1	0.6 r	1.6	2.1	28.4	57.6
Data processing, hosting, and related services	518	8,918	3.8	1.2	0.9 r	0.1 r	2.4	0.6	1.4	3.0	16.6	72.1
Other information	other 51	27,965	4.1	0.8	0.5 r	0.3 r	1.7	0.4 r	0.4	1.6	27.3	63.0
Finance and insurance	52	200,857	3.9	0.5	0.5	0.2	0.6	1.2	1.5	0.7	27.4	62.8
Real estate and rental and leasing	53	255,783	4.0	0.4	0.3	0.1	0.5	0.4	0.5	0.7	37.6	55.3
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	D	0.0	0.0	0.0	D	0.0	0.0	10.9	34.1	51.7
Other real estate and rental and leasing	other 53	253,970	4.0	0.4	0.3	0.1	0.4	0.4	0.5	0.6	37.6	55.4
Professional, scientific, and technical services	54	695,672	4.9	0.6	0.3	0.3	1.0	0.7	1.1	1.3	28.2	61.7
Legal services	5411	152,243	4.3	0.5	0.3	0.2	0.7	0.6	1.3	0.9	32.1	58.0

TABLE 143

**Factors adversely affecting production of specialized software or goods or services that included specialized software, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	4.7	0.5	0.5	0.3	0.6	1.8	2.3	0.7	20.7	67.7
Architectural, engineering, and related services	5413	88,491	6.7	0.6	0.4	0.2	1.2	0.3	0.6	1.5	26.1	63.3
Specialized design services	5414	26,282	5.6	0.3 r	D	D	0.8	D	0.9	0.4	36.9	54.5
Computer systems design and related services	5415	95,950	5.3	0.9	0.5	0.5	1.8	0.6	1.1	2.3	19.1	69.3
Management, scientific, and technical consulting services	5416	132,989	3.9	0.5	0.4	0.2	0.9	0.5	0.4	1.3	34.6	57.3
Scientific research and development services	5417	9,798	5.9	0.9	0.4	0.2	1.8	0.6	1.1	3.0	31.1	56.2
Advertising, public relations, and related services	5418	27,677	4.5	0.4	0.1	0.1	0.7	0.1	0.4	1.4	33.1	58.8
Other professional, scientific, and technical services	5419	55,569	5.3	0.6	0.2 r	0.1 r	1.6	0.7	0.7	1.1	29.0	60.6
Management of companies and enterprises	55	2,409	0.0	0.0	D	0.0	D	D	0.0	0.0	29.3	68.4
Administrative and support and waste management and remediation services	56	287,807	5.8	0.3	0.4	0.2	0.6	0.3	0.6	1.1	39.6	50.9
Educational services	61	53,912	3.6	0.4	D	0.3 r	0.4	0.2 r	0.5	0.6	39.5	53.8
Health care and social assistance	62	519,556	6.4	0.9	0.4	0.3	0.6	1.4	1.4	1.2	33.3	55.4
Health care services	621–23	459,855	6.5	1.0	0.4	0.4	0.6	1.6	1.5	1.2	32.2	56.4
Social assistance	624	59,700	5.4	0.2 r	0.2 r	D	0.5	0.4	0.4 r	1.3	41.5	48.3
Arts, entertainment, and recreation	71	88,831	3.4	0.5	0.4	D	0.2	D	0.4	1.0	40.8	52.9
Accommodation and food services	72	453,059	7.0	0.7	0.5	0.2	0.7	0.4	0.6	1.0	42.7	46.7
Other services	81	345,125	6.5	0.5	0.5	0.2	0.5	0.4	0.5	1.1	41.2	48.6

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

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. 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.

TABLE 144

**Factors adversely affecting production of specialized software or goods or services that included specialized software, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
All companies	4,805,151	5.8	0.5	0.4	0.2	0.7	0.6	0.8	1.1	37.3	52.6
Micro companies											
1–4	2,667,724	5.7	0.4	0.4	0.2	0.7	0.5	0.7	1.0	39.3	50.7
5–9	936,576	6.4	0.7	0.5	0.3	0.7	0.6	0.9	1.1	36.6	52.6
Small companies											
10–19	579,513	6.1	0.6	0.4	0.2	0.8	0.5	0.8	1.2	34.6	55.3
20–49	402,199	5.3	0.7	0.4	0.3	0.7	0.6	0.8	1.1	34.0	57.0
Medium companies											
50–99	119,497	5.0	0.6	0.6	0.4	1.4	0.7	1.0	1.5	29.8	60.6
100–249	65,565	4.8	0.8	0.5	0.2	0.8	0.7	1.1	1.2	29.2	61.7
Large companies											
250–499	18,897	6.9	0.9	0.3	0.3	2.1	0.3	1.3	1.5	26.9	62.0
500–999	7,289	4.3	0.7	0.5	0.3	1.1	0.4	1.8	0.8	28.8	62.4
1,000–4,999	6,199	7.2	2.0	0.6	0.7	1.7	1.4	3.1	2.5	22.1	64.9
5,000–9,999	823	5.0	1.7	1.8	1.0	2.9	0.7	2.2	1.3	22.1	62.9
10,000–24,999	514	5.4	2.5	1.8	3.1	3.5	3.1	4.1	2.5	16.0	67.1
25,000 or more	358	19.6	3.9	2.0	2.5	7.5	2.5	5.9	2.8	22.9	49.7

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. 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.

TABLE 145

## Factors adversely affecting production of robotics or goods or services that included robotics, by industry: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
All industries	11, 21–23, 31–33, 42–81	4,805,151	5.2	0.6	0.3	0.2	0.5	0.3	0.4	0.7	49.2	42.5
Manufacturing industries	31–33	217,565	10.9	0.7	0.4	0.1	1.6	0.3	0.4	2.3	40.1	44.5
Food	311	18,250	11.5	0.6	0.3 r	0.2 r	1.3	0.3 r	0.4 r	2.1	43.9	40.5
Beverage and tobacco products	312	7,723	8.9	0.9	0.6 r	0.2 r	0.8 r	0.3	0.3	2.5	37.7	48.5
Textile, apparel, and leather products	313–16	10,554	10.0	1.1	0.2	0.1	1.3	0.2	0.6 r	1.6	42.2	42.1
Wood products	321	11,012	10.0	0.9 r	D	D	0.8	D	D	1.6	42.0	43.1
Paper	322	2,117	10.1	0.3	0.0	D	1.2 r	0.0	1.3 r	3.1 r	48.4	38.5
Printing and related support activities	323	20,851	8.5	0.6	0.3	0.2	0.5	0.1 r	0.2	1.0	43.5	44.4
Petroleum and coal products	324	583	14.4 r	D	D	D	0.7	D	D	D	37.6	46.8
Chemicals	325	7,522	12.4	0.9	0.6 r	0.3	1.7	0.3	0.3	3.1	37.9	44.7
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	2.4	D	0.0	0.0	D	D	D	D	42.7	48.6
Pharmaceuticals and medicines	3254	1,365	9.8	0.7 r	0.0	D	0.6	D	D	2.9	41.8	43.8
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	14.8	0.4	D	D	4.3 r	D	D	9.2 r	30.7	47.4
Other chemicals	other 325	3,927	13.8	1.2 r	0.9 r	0.3 r	1.2	0.4 r	0.4	1.0	38.8	43.3
Plastics and rubber products	326	8,087	15.4	0.7	0.5	0.1 r	5.0	0.4	1.0 r	4.7	35.6	42.1
Nonmetallic mineral products	327	7,749	8.8	0.4	0.2	0.2	1.0	0.4 r	0.1	1.4	44.0	43.7
Primary metals	331	2,537	12.2	0.8	0.7 r	0.0	1.1	D	D	2.6	33.4	49.0
Fabricated metal products	332	48,472	12.6	0.6	0.3 r	0.1 r	1.7	0.4	0.3	2.3	37.4	46.0
Machinery	333	18,558	10.0	0.8	0.5 r	0.1 r	1.8	0.2 r	1.0	2.9	39.2	45.0
Computer and electronic products	334	9,036	7.8	1.0	0.8	0.4 r	2.0	0.5	0.7	2.8	38.9	48.5
Communications equipment	3342	974	7.2	D	D	D	0.9 r	D	1.8 r	1.1	44.1	45.1
Semiconductor and other electronic components	3344	2,796	9.9	1.6 r	0.5	0.1	1.5	0.0	0.3 r	2.9	37.9	46.6
Navigational, measuring, electromedical, and control instruments	3345	3,909	6.8	1.0	0.9 r	0.3	2.9	0.7 r	0.8	3.2	37.5	51.1
Other computer and electronic products	other 334	1,359	6.8	0.2 r	0.0	D	0.8 r	D	D	2.9	41.4	47.4
Electrical equipment, appliances, and components	335	4,000	9.6	1.0	1.2 r	D	1.4	D	0.3	2.3	38.9	47.3
Transportation equipment	336	7,175	12.3	0.7	1.0 r	0.2	3.0	0.2	0.7 r	3.4	36.9	45.6
Automobiles, bodies, trailers, and parts	3361–63	4,565	13.2	0.6	1.4 r	0.1 r	4.2	0.1 r	1.1 r	3.5	34.3	46.7

TABLE 145

## Factors adversely affecting production of robotics or goods or services that included robotics, by industry: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Aerospace products and parts	3364	985	10.8	1.8	0.5	0.5	1.2	D	0.3	3.9	34.4	50.3
Other transportation	other 336	1,625	10.6	0.6	0.4	D	0.9 r	D	0.0	2.8	45.9	39.9
Furniture and related products	337	12,647	11.7	0.4	0.3	0.1	1.9	0.1 r	0.5 r	3.0	40.0	42.9
Miscellaneous	339	20,669	9.8	1.3	0.4 r	0.2 r	1.7	0.2 r	0.2 r	2.0	42.2	43.9
Medical equipment and supplies	3391	8,060	12.5	2.2	0.1	D	1.7	0.2 r	0.1	3.1	40.5	42.5
Other miscellaneous manufacturing	3399	12,608	8.1	0.7	0.6 r	0.2 r	1.7 r	0.2 r	0.2 r	1.3	43.3	44.8
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	5.0	0.6	0.3	0.2	0.4	0.3	0.4	0.7	49.7	42.4
Agriculture, forestry, fishing, and hunting	11	21,606	4.6	0.6	D	D	D	D	D	0.9 r	54.2	39.2
Mining, extraction, and support activities	21	14,969	4.5	0.7 r	0.6 r	D	0.3 r	0.0	0.0	0.3 r	49.0	43.8
Utilities	22	2,684	4.2 r	0.8	D	0.0	0.6 r	D	0.4	1.6 r	48.4	44.2
Construction	23	613,110	4.5	0.3	0.3	0.1	0.4	0.2	0.3	0.4	52.3	40.7
Wholesale trade	42	257,153	6.4	0.7	0.4	0.3	0.8	0.2	0.3	1.0	47.6	42.5
Retail trade	44–45	560,952	6.9	0.4	0.3	0.2	0.5	0.2	0.3	0.8	49.1	41.5
Transportation and warehousing	48–49	152,463	5.4	0.8	0.3	0.2	0.4	0.5	0.4	0.9	48.0	42.1
Information	51	61,638	3.3	0.7	0.4	0.1	0.6	0.2 r	0.4	0.7	48.3	44.8
Publishing	511	17,590	3.7	0.7	0.2 r	0.1 r	0.7	0.2 r	0.3 r	0.5	47.6	45.8
Newspaper, periodical, book, and directory publishers	5111	9,761	4.2	0.2	0.2 r	0.1 r	0.5	D	0.5 r	0.5	45.6	47.2
Software publishers	5112	7,828	3.0	1.3 r	0.2 r	D	0.9 r	D	0.1	0.6	50.1	44.0
Telecommunications	517	7,164	5.5	0.7 r	0.8 r	0.4 r	0.9	0.3 r	0.6 r	1.1	45.3	45.5
Data processing, hosting, and related services	518	8,918	3.2	0.9	0.9 r	D	0.6	0.3 r	0.2	1.1	48.5	44.2
Other information	other 51	27,965	2.5	0.7	0.3 r	0.1	0.5	0.1 r	0.4 r	0.5	49.4	44.1
Finance and insurance	52	200,857	2.8	0.4	0.3	0.2	0.3	0.5	0.4	0.4	44.3	48.8
Real estate and rental and leasing	53	255,783	2.9	0.2	0.2	0.2	0.3	0.3	0.2	0.4	50.3	44.4
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	D	0.0	0.0	0.0	D	0.0	0.0	7.8	39.8	48.3
Other real estate and rental and leasing	other 53	253,970	2.9	0.2	0.2	0.2	0.3	0.3	0.2	0.3	50.4	44.4
Professional, scientific, and technical services	54	695,672	3.4	0.6	0.2	0.2	0.5	0.3	0.4	0.6	49.7	43.4
Legal services	5411	152,243	2.1	0.4	0.2	0.1	0.2	0.2	0.2	0.4	53.9	40.0

TABLE 145

**Factors adversely affecting production of robotics or goods or services that included robotics, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology				
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	4.1	0.6	0.2	0.2	0.4	0.5	0.8	0.4	44.4	47.1				
Architectural, engineering, and related services	5413	88,491	4.1	0.5	0.2	0.2	0.7	0.2	0.5	0.7	49.9	43.3				
Specialized design services	5414	26,282	3.3	0.3	r	D	D	0.0	D	D	57.8	36.4				
Computer systems design and related services	5415	95,950	4.2	1.3	0.4	0.3	1.0	0.3	0.5	1.3	46.7	45.2				
Management, scientific, and technical consulting services	5416	132,989	2.8	0.5	0.2	0.1	0.4	0.2	0.2	0.4	49.0	45.2				
Scientific research and development services	5417	9,798	5.5	1.1	0.4	0.2	1.7	0.3	0.6	2.3	47.5	41.7				
Advertising, public relations, and related services	5418	27,677	3.3	0.3	r	0.3	r	0.2	r	0.2	r	0.6	49.3	45.3		
Other professional, scientific, and technical services	5419	55,569	4.1	0.2	0.1	r	D	0.6	0.5	0.6	51.3	41.5				
Management of companies and enterprises	55	2,409	D	0.0	D	0.0	D	0.0	0.0	0.0	37.3	58.3				
Administrative and support and waste management and remediation services	56	287,807	5.2	0.5	0.3	0.2	0.4	0.3	0.3	0.6	50.7	41.3				
Educational services	61	53,912	2.9	0.4	r	D	D	0.2	r	0.2	r	0.4	r	0.4	53.9	41.0
Health care and social assistance	62	519,556	5.0	1.1	0.3	0.2	0.4	0.5	0.6	0.6	50.1	41.7				
Health care services	621–23	459,855	5.1	1.1	0.3	0.3	0.3	0.6	0.6	0.6	49.8	42.0				
Social assistance	624	59,700	4.5	0.6	0.2	r	D	0.5	0.2	r	0.3	0.6	52.3	39.3		
Arts, entertainment, and recreation	71	88,831	2.9	0.3	D	D	0.2	r	0.1	r	0.2	r	0.4	51.7	43.8	
Accommodation and food services	72	453,059	7.2	0.8	0.4	0.3	0.6	0.3	0.4	0.8	48.3	41.6				
Other services	81	345,125	5.8	0.5	0.4	0.2	0.4	0.2	0.4	0.8	50.1	41.4				

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

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. 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.

TABLE 146

**Factors adversely affecting production of robotics or goods or services that included robotics, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
All companies	4,805,151	5.2	0.6	0.3	0.2	0.5	0.3	0.4	0.7	49.2	42.5
Micro companies											
1–4	2,667,724	4.9	0.5	0.3	0.2	0.4	0.3	0.3	0.7	50.1	41.7
5–9	936,576	5.7	0.6	0.3	0.2	0.5	0.3	0.4	0.8	49.6	41.9
Small companies											
10–19	579,513	5.8	0.6	0.3	0.2	0.6	0.3	0.4	0.8	47.2	44.0
20–49	402,199	5.4	0.9	0.4	0.2	0.6	0.3	0.4	0.8	47.7	44.3
Medium companies											
50–99	119,497	5.3	0.9	0.5	0.3	0.9	0.2	0.5	1.0	45.8	46.1
100–249	65,565	4.8	1.1	0.4	0.1 r	0.9	0.2 r	0.6	1.0	45.8	45.5
Large companies											
250–499	18,897	7.0	0.8	0.4 r	0.1	1.7 r	0.4 r	0.4 r	1.3 r	43.1	47.8
500–999	7,289	4.2	2.0 r	0.2	0.2	0.9	0.2	0.6	0.9	44.8	47.3
1,000–4,999	6,199	7.2 r	3.7 r	0.8	0.5	1.5	1.0 r	1.0	0.9	35.9	53.1
5,000–9,999	823	5.0	3.3	1.6	0.9	2.4	0.4	1.1	1.8	34.6	52.1
10,000–24,999	514	8.6	5.4	2.7	1.6	3.9	1.8	3.9	1.6	27.4	54.5
25,000 or more	358	17.9 r	8.7	2.0	2.2	5.9	1.4	3.1	2.0	29.9	41.1

r = relative standard error &gt; 50%.

**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. 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.



TABLE 147

## Factors adversely affecting production of specialized equipment or goods or services that included specialized equipment, by industry: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
All industries	11, 21–23, 31–33, 42–81	4,805,151	5.7	0.4	0.3	0.2	0.6	0.4	0.5	1.2	42.8	48.0
Manufacturing industries	31–33	217,565	10.5	0.4	0.4	0.2	1.7	0.3	0.4	3.1	31.1	53.3
Food	311	18,250	11.1	0.5	0.3 r	0.3 r	1.4	0.6 r	0.7 r	2.6	37.6	46.4
Beverage and tobacco products	312	7,723	9.5	0.3	0.6 r	0.2 r	1.0	0.6	0.2 r	4.0	28.4	56.3
Textile, apparel, and leather products	313–16	10,554	11.7	0.4	0.2	0.1	1.8	0.3	0.5 r	2.2	34.1	49.8
Wood products	321	11,012	9.8	0.2 r	0.2 r	D	1.2	D	0.6 r	2.3	35.5	48.7
Paper	322	2,117	4.5	0.3	D	0.0	0.1	0.0	1.0 r	3.4 r	42.8	46.8
Printing and related support activities	323	20,851	9.5	0.6 r	0.2	0.1 r	0.7	0.1 r	0.4	2.6	31.2	55.0
Petroleum and coal products	324	583	5.3 r	0.0	D	D	3.4 r	D	0.9	D	30.2	59.2
Chemicals	325	7,522	10.9	0.7 r	0.6 r	0.2 r	1.4	0.2 r	0.4	4.1	29.6	53.7
Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	593	6.6 r	0.0	0.0	0.0	0.0	0.0	D	D	30.0	61.2
Pharmaceuticals and medicines	3254	1,365	8.4	0.6 r	D	D	0.7	D	0.3 r	4.7	30.9	54.1
Soap, cleaning compound, and toilet preparation manufacturing	3256	1,636	14.5	0.2 r	2.5 r	D	3.2 r	D	D	10.5 r	24.1	51.8
Other chemicals	other 325	3,927	10.9	1.0 r	0.1	D	1.2	0.2 r	0.4	1.8	31.3	53.2
Plastics and rubber products	326	8,087	12.6	0.5	0.3	D	4.0	0.2 r	1.0 r	4.5	28.5	52.1
Nonmetallic mineral products	327	7,749	8.7	0.5	0.5 r	0.3	1.2	0.6 r	0.2	3.1	37.3	49.0
Primary metals	331	2,537	14.5	0.6	D	0.2	0.7	D	D	2.3	27.7	52.5
Fabricated metal products	332	48,472	10.8	0.3	0.3	0.1	1.7	0.2 r	0.3 r	3.0	28.8	56.1
Machinery	333	18,558	9.5	0.6 r	0.7	0.2	1.9	0.2 r	0.4 r	3.6	28.4	56.7
Computer and electronic products	334	9,036	7.9	0.6	0.2	0.2 r	2.5	0.4	0.4	3.8	26.1	60.2
Communications equipment	3342	974	5.5	D	0.0	0.0	3.6 r	D	D	4.2	25.1	63.9
Semiconductor and other electronic components	3344	2,796	8.6	1.1 r	0.4 r	D	1.6	D	0.2	4.4	28.8	54.8
Navigational, measuring, electromedical, and control instruments	3345	3,909	7.8	0.2 r	0.2	0.2 r	3.0	0.6 r	0.8 r	3.6	22.7	65.0
Other computer and electronic products	other 334	1,359	8.2	1.2	0.0	D	2.1 r	D	D	3.0	31.3	54.7
Electrical equipment, appliances, and components	335	4,000	8.7	0.2 r	1.2 r	0.2	2.7 r	0.0	0.4	2.6	29.3	56.2
Transportation equipment	336	7,175	12.4	0.4	1.5 r	0.5 r	2.2	0.7 r	1.0 r	3.5	31.0	51.3
Automobiles, bodies, trailers, and parts	3361–63	4,565	14.0	0.2 r	2.1 r	0.7 r	2.8	0.2	1.1 r	3.2	29.1	51.8

TABLE 147

## Factors adversely affecting production of specialized equipment or goods or services that included specialized equipment, by industry: 2016–18

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Aerospace products and parts	3364	985	9.2	1.2	0.8	D	1.0	2.2 r	0.9 r	4.1	26.8	59.1
Other transportation	other 336	1,625	9.8	D	D	D	1.4 r	1.2 r	D	3.8	38.7	45.3
Furniture and related products	337	12,647	12.3	D	0.2	0.3 r	2.5	0.1 r	0.1 r	4.2	31.1	50.8
Miscellaneous	339	20,669	11.1	0.8	0.3 r	0.4 r	1.5	0.2 r	0.2 r	2.7	31.3	52.4
Medical equipment and supplies	3391	8,060	15.0	1.2 r	D	0.2 r	1.5	0.3 r	0.3 r	4.1	27.7	50.8
Other miscellaneous manufacturing	3399	12,608	8.7	0.5 r	0.5 r	0.6 r	1.5	0.2 r	0.2 r	1.8	33.6	53.4
Nonmanufacturing industries	11, 21–23, 42–81	4,587,586	5.5	0.4	0.3	0.2	0.5	0.4	0.5	1.1	43.4	47.8
Agriculture, forestry, fishing, and hunting	11	21,606	5.4	0.3 r	D	D	0.5 r	D	D	1.1	46.3	46.0
Mining, extraction, and support activities	21	14,969	4.6	0.3 r	0.6 r	0.1	0.3 r	0.2 r	0.3	1.3	43.2	48.9
Utilities	22	2,684	3.3	0.2 r	D	0.0	0.8	0.2	0.3	2.4	41.8	51.2
Construction	23	613,110	4.9	0.3	0.3	0.1	0.5	0.3	0.4	0.9	46.0	46.2
Wholesale trade	42	257,153	6.1	0.5	0.4	0.2	0.9	0.4	0.4	1.3	42.7	47.2
Retail trade	44–45	560,952	7.0	0.4	0.4	0.2	0.5	0.3	0.4	1.2	44.3	45.7
Transportation and warehousing	48–49	152,463	5.8	0.4	0.4	0.2	0.4	1.0	0.7	1.2	43.5	45.9
Information	51	61,638	4.0	0.5	0.4	0.1	0.8	0.2	0.3	1.7	37.7	54.0
Publishing	511	17,590	4.1	0.5	0.1 r	0.1 r	0.6 r	0.2 r	0.3 r	1.4	40.8	51.7
Newspaper, periodical, book, and directory publishers	5111	9,761	4.8	0.2	0.2 r	0.1 r	0.4 r	D	0.5 r	0.9	41.0	51.7
Software publishers	5112	7,828	3.4	0.8	D	D	0.8 r	0.2 r	0.2	1.9	40.6	51.8
Telecommunications	517	7,164	6.4	0.6	0.8 r	0.5	1.1	0.5 r	0.8	2.2	33.9	55.1
Data processing, hosting, and related services	518	8,918	2.9	1.1	0.7 r	D	0.7 r	0.2 r	0.4	2.0	38.1	54.1
Other information	other 51	27,965	3.7	0.4	0.4 r	0.1 r	0.9	0.1 r	0.1	1.8	36.5	55.2
Finance and insurance	52	200,857	3.1	0.2	0.4	0.2	0.5	0.6	0.5	0.5	40.9	52.3
Real estate and rental and leasing	53	255,783	3.1	0.2	0.3	0.1	0.3	0.3	0.3	0.5	47.0	47.3
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1,812	6.2 r	0.0	0.0	0.0	D	0.0	0.0	8.6	39.7	48.5
Other real estate and rental and leasing	other 53	253,970	3.1	0.2	0.3	0.1	0.3	0.4	0.3	0.5	47.0	47.3
Professional, scientific, and technical services	54	695,672	3.9	0.5	0.2	0.2	0.6	0.4	0.5	1.1	42.4	50.0
Legal services	5411	152,243	2.7	0.4	0.3	0.1 r	0.4	0.2	0.4	0.6	48.8	44.8

TABLE 147

**Factors adversely affecting production of specialized equipment or goods or services that included specialized equipment, by industry: 2016–18**

(Number and percent)

Industry	NAICS code	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
Accounting, tax preparation, bookkeeping, and payroll services	5412	106,634	4.3	0.4	0.2	0.2 r	0.3	0.9	0.8	0.6	39.8	52.1
Architectural, engineering, and related services	5413	88,491	5.6	0.7	0.2	0.3	0.8	0.3	0.3	1.4	37.3	53.7
Specialized design services	5414	26,282	4.1	D	D	D	0.6 r	0.0	0.6	1.2	49.5	43.4
Computer systems design and related services	5415	95,950	4.2	0.8	0.4	0.3	0.8	0.4	0.7	1.9	38.4	52.8
Management, scientific, and technical consulting services	5416	132,989	3.0	0.3	0.1	0.2	0.5	0.3	0.3	0.9	44.7	49.2
Scientific research and development services	5417	9,798	6.7	1.3 r	0.4	0.1	1.5	0.5	0.5	4.2	33.5	52.7
Advertising, public relations, and related services	5418	27,677	3.4	0.3 r	0.2	0.0	0.3	0.1 r	0.2 r	1.2	43.1	50.6
Other professional, scientific, and technical services	5419	55,569	5.5	0.3	0.3 r	D	1.0	0.6	0.6	1.3	37.2	53.7
Management of companies and enterprises	55	2,409	0.0	0.0	D	0.0	D	0.0	0.0	0.0	35.1	62.6
Administrative and support and waste management and remediation services	56	287,807	5.4	0.3	0.3	0.2	0.4	0.3	0.4	1.1	44.5	47.0
Educational services	61	53,912	3.4	0.4 r	D	0.3 r	0.2 r	D	D	0.4	49.2	45.0
Health care and social assistance	62	519,556	6.7	0.8	0.3	0.3	0.5	0.7	0.7	1.3	38.6	50.9
Health care services	621–23	459,855	7.0	0.8	0.4	0.3	0.5	0.8	0.8	1.3	37.1	52.2
Social assistance	624	59,700	4.5	0.3	0.2	D	0.5	0.2 r	0.5	1.3	50.3	40.6
Arts, entertainment, and recreation	71	88,831	3.4	0.4	0.3	D	0.3 r	D	0.3	0.7	45.9	48.9
Accommodation and food services	72	453,059	7.2	0.6	0.4	0.2	0.5	0.3	0.4	1.2	44.8	44.8
Other services	81	345,125	6.6	0.3	0.4	0.2	0.5	0.5	0.4	1.4	42.3	47.5

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

NAICS = 2017 North American Industry Classification System.

**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. 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.

TABLE 148

**Factors adversely affecting production of specialized equipment or goods or services that included specialized equipment, by company size: 2016–18**

(Number and percent)

Employment size	Companies (number)	This technology was too expensive	The technology was not mature	Lacked access to required data	Required data not reliable	Lacked access to required human capital and talent	Laws and regulations	Concerns regarding safety and security (physical security and/or cybersecurity)	Lacked access to capital	Technology not applicable to this business	No factors adversely affected the adoption of this technology
All companies	4,805,151	5.7	0.4	0.3	0.2	0.6	0.4	0.5	1.2	42.8	48.0
Micro companies											
1–4	2,667,724	5.4	0.4	0.3	0.2	0.5	0.4	0.4	1.1	44.9	46.2
5–9	936,576	6.4	0.5	0.4	0.2	0.6	0.5	0.6	1.3	41.8	48.3
Small companies											
10–19	579,513	6.0	0.5	0.3	0.2	0.6	0.4	0.5	1.3	39.7	50.9
20–49	402,199	5.6	0.6	0.3	0.2	0.6	0.4	0.6	1.3	39.6	51.8
Medium companies											
50–99	119,497	5.1	0.5	0.4	0.3	0.8	0.3	0.6	1.5	36.6	54.9
100–249	65,565	4.3	0.8	0.3	0.0	0.9	0.5	0.6	1.3	36.2	55.5
Large companies											
250–499	18,897	6.7	0.6 r	0.3 r	0.6 r	1.6	0.4 r	0.7 r	1.2 r	34.7	55.9
500–999	7,289	3.9 r	0.9	0.3	0.2	0.6	0.3	0.5	0.7	37.5	55.5
1,000–4,999	6,199	6.6 r	1.9 r	0.5	0.5	1.2	1.1 r	1.7 r	1.1	30.3	59.1
5,000–9,999	823	4.5	1.8	1.0	0.7	2.1	D	1.1	1.3	30.0	57.6
10,000–24,999	514	6.2	3.3	1.6	1.6	3.3	2.9	2.9	1.6	22.4	63.2
25,000 or more	358	19.8 r	4.7	2.8	1.7	4.5	1.1	5.0	4.2	27.1	45.8

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

**Note(s):**

Detail may not add to total because of rounding. Detail may exceed total because companies could select more than one response. 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.

## Technical Notes

---

### Survey Overview (2019 survey cycle: data year 2018)

*Purpose.* The Annual Business Survey (ABS) provides information on selected economic and demographic characteristics for businesses and for business owners, by sex, ethnicity, race, and veteran status. In addition, the survey measures research and development for microbusinesses, business topics such as innovation and technology, and other business characteristics. The ABS is conducted jointly by the Census Bureau and the National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation (NSF). The ABS replaces the quinquennial Survey of Business Owners for employer businesses, the Annual Survey of Entrepreneurs, the Business R&D and Innovation for Microbusinesses survey (BRDI-M), and the Innovation section of the Business R&D and Innovation Survey.

The ABS is designed to incorporate new content each survey year based on topics of relevance. For the 2019 ABS (data year 2018), content includes innovation, R&D, and technology and intellectual property. The ABS also collects various data regarding business owners—such as sex, ethnicity, race, veteran status—and data on other business characteristics. R&D data are collected on the ABS for businesses with a W-2 employment range between one to nine employees.

*Data collection authority.* Title 13, United States Code, Sections 8(b), 131, and 182; Title 42, United States Code, Section 1861-76 (NSF Act of 1950, as amended); and Section 505 within the America COMPETES Reauthorization Act of 2010, authorize this collection. Sections 224 and 225 of Title 13 require mandatory response. Office of Management and Budget (OMB) No. 0607-1004.

*Survey sponsor.* NCSES.

*Survey collection and tabulation agent.* The survey is conducted annually by the Census Bureau in accordance with an interagency agreement with NCSES.

### Key Survey Information

*Frequency.* Annual.

*Initial survey year.* 2017; for innovation, the reference period was 2015 to 2017.

*Reference period.* 2018; for innovation, the reference period is 2016 to 2018.

*Response unit.* Firm.

*Sample or census.* Sample.

*Population size.* A total of 5.3 million employer firms were in scope for sampling; additional out-of-scope firms were identified before tabulation based on either response or updated administrative data not available at the time of sampling, which resulted in 4.9 million employer firms in-scope for innovation and technology modules. Approximately 500,000 firms with one to nine employees and in North American Industry Classification System (NAICS) industries 31–33 (manufacturing), 42 (wholesale trade), 51 (information), 5413 (architectural, engineering, and related services), 5415 (computer systems design and related services), or 5417 (scientific research and development services) were in-scope for the R&D module.

*Sample size.* A total of 299,976 employer businesses.

### Survey Design

*Target population.* Included are all nonfarm businesses filing Internal Revenue Service (IRS) tax forms as individual proprietorships, partnerships, or any type of corporation and with receipts of \$1,000 or more. The ABS covers firms with paid employees only. The ABS is conducted on a company or firm basis rather than an establishment basis.

*Sampling frame.* The sampling universe was constructed from the final 2017 Business Register. The Business Register is the Census Bureau’s comprehensive database of U.S. businesses. Business Register data are compiled from a combination of business tax returns, data collected from the Economic Census, and data from other Census Bureau surveys. The 2017 Business Register includes sole proprietorships, partnerships, and corporations reporting business activity to the IRS on any one of the following 2017 IRS tax forms: 1040 (Schedule C), “Profit or Loss from Business” (Sole Proprietorship); 1065, “U.S. Return of Partnership Income”; 941, “Employer’s Quarterly Federal Tax Return”; 944, “Employer’s Annual Federal Tax Return”; or any one of the 1120 corporate tax forms.

The Business Register contains establishments that are out of scope for the ABS sample. These establishments are removed from the sampling universe. They include the following:

- Establishments engaged in the following NAICS industries:
  - 110000, 111, or 112 - Agriculture production
  - 482 - Railroads
  - 491 - U.S. Postal Service
  - 521 - Monetary authorities—central bank
  - 525 - Funds, trusts, and other financial vehicles
  - 813 - Religious grant operations and religious organizations
  - 814 - Private households
  - 92 - Public administration
  - Unclassified with legal form of organization as tax-exempt or unknown
- Establishments located in American Samoa, Northern Mariana Islands, Guam, Puerto Rico, or the Virgin Islands
- Establishments belonging to foreign entities
- Government establishments
- Establishments with zero payroll and zero employment
- Establishments identified as out of business during prior year data review
- Single-unit establishments modeled as likely to be out of business using administrative data from the most recent monthly business register data sets.

Information on industry classification, receipts, payroll, and employment was extracted from the Business Register during the frame construction.

The sample is also designed to estimate demographic characteristics of the business owners. To efficiently sample demographic characteristics, a variety of sources of information is used to estimate the likelihood that a business is women- or minority-owned. Administrative sources include the Decennial Census, the American Community Survey (ACS), and the Numident file, which is the Social Security Administration’s comprehensive database of information from Social Security applications. Individual business owners are identified through IRS K-1 filings for partnerships and corporations and from the Business Register for sole proprietorships. The owners are matched to the 2000 and 2010 Decennial Censuses in order to get race, sex, and ethnicity data; the 2000–17 ACS; and the Numident, (in that order) through a Protected Identification Key. Country of birth is also identified through the linkages to the ACS or Numident data. Each

firm is then placed in one of the following nine strata for sampling: American Indian or Alaska Native, Asian, Black or African American, Hispanic, White men who are not Hispanic, Native Hawaiian and Other Pacific Islander, other race or ethnicity, publicly owned, and women. Businesses are assigned to only one stratum with priority given to the less common stratum.

*Sample design.* The ABS frame is stratified by geographic area defined by state, race and ethnicity stratum, and industry, and is systematically sampled within each stratum. A standard type of estimation for stratified systematic sampling is used. Large companies were selected with certainty based on volume of sales, payroll, or number of paid employees. Certainty cases have a selection probability of one and a sampling weight of one and represent only themselves. Specifically for the 2019 ABS, firms were selected with certainty based on the following criteria:

- Firms with more than 500 employees
- Firms that had more than \$1 million in R&D expenses in the 2016 BRDI-M survey
- Firms larger than stratum-specific payroll and receipt cut-offs

The certainty cutoffs vary by sampling stratum, and each stratum is sampled at varying rates, depending on the number and size of firms in a particular stratum.

The remaining frame is subjected to stratified systematic random sampling. Sampling rates vary by strata.

The coefficient of variation (CV) is initially set to 0.14, then it is adjusted to achieve the desired sample size. The final CV values were 0.15 for cases in the minority or female frames and 0.5 for cases in the public or not Hispanic, white men frames.

Each firm selected into the sample was asked to provide information on the business's innovations and innovation activities and technology (patents, intellectual property, cloud service purchases, and business technologies). Additionally, firms that were not part of the 2017 data year sample were asked to provide the percentage of ownership, sex, ethnicity, race, age, education level, and veteran status for up to four persons owning the largest percentages in the business. Firms that were included in the 2017 ABS (data year 2017) were not asked the ownership questions, and prior year response data were used for data year 2018. Firms in NAICS industries 31–33 (manufacturing), 42 (wholesale trade), 51 (information), 5413 (architectural, engineering, and related services), 5415 (computer systems design and related services), or 5417 (scientific research and development services) with one to nine employees were asked to provide information regarding R&D.

The ABS sample consisted of 299,976 businesses. There were 41,793 selected with certainty. The certainty portion of the sample consisted of the following:

- 16,930 with employment  $\geq 500$
- 705 with R&D expenses greater than \$1 million in 2016 BRDI-M
- 16,219 with payroll above the stratum cutoff
- 7,939 with receipts above the stratum cutoff (note payroll cutoffs are applied first so cases above both cutoffs appear in payroll count)

The remaining 258,183 noncertainty cases were selected using the systematic stratified random sample selection. The maximum sample weight was 35.

## Data Collection and Processing Methods

*Data collection.* Prior to mailing the survey, certain businesses selected were determined to be out of scope and were not contacted. The survey was mailed to 299,976 employer businesses in July 2019. Businesses were sent a letter informing them of their requirement to report. The letter also provided instructions on how to access the survey and submit online. There were three mail follow-ups conducted to increase response. The third mail follow-up included a paper questionnaire for select nonrespondents. Additionally, the Census Bureau conducted e-mail follow-ups to respondents who entered the electronic system but did not submit the questionnaire. The collection period closed in January 2020.

*Mode.* The 2019 ABS (data year 2018) was collected using both a paper form and the electronic instrument.

*Check-in rate.* The check-in rate is defined as the unweighted number of surveys that were submitted online by in-scope companies, divided by the unweighted total number of all in-scope companies in the sample. Response to individual questions did not factor into this metric. At the close of the collection period in January 2020, there were 211,198 responses submitted. Of those, 205,375 reported online (68.5% of the total sample) and 5,823 reported using the paper form (1.9% of the total sample).

There were an additional 3,566 businesses that contacted the Census Bureau via the call center to indicate the business was no longer in operation or had been sold during the reference year.

Businesses selected to report R&D represented 37.6% of those mailed. Of the businesses mailed and selected to report R&D, 82,044 businesses submitted responses, or 72.7%.

*Unit response rate (URR).* The URR is the unweighted number of responding companies for the survey. For the ABS, response is defined as a company providing the number of owners, number of paid owners, and number of employees or as a company responding that they ceased operations prior to 2018.

For the ABS, the URR was 71.8%. The URR for businesses eligible to report the R&D module was 73.4%

*Item response rates.* The ABS collects data on approximately 650 variables, and the distribution of values reported by sample companies is highly skewed. Thus, rather than report unweighted item response rates, total quantity response rates are calculated, which are based on weighted data. The survey skip patterns vary for respondents, and therefore, it can be impossible to know an exact denominator for item response calculations.

*Total quantity response rate (TQRR).* For a given published estimate other than count or ratio estimates, TQRR is the percentage of the weighted estimate based on data that were reported by units in the sample or on data that were obtained from other sources and were determined to be equivalent in quality to reported data and weighted only by sampling but not nonresponse weights. The TQRR for total sales in the United States in 2018 was 64.0%.

*Total quantity nonresponse rate (TQNR).* For a given published estimate, TQNR, defined as 100% minus TQRR, is calculated for each tabulation cell from the ABS, except for cells that contain count or ratio estimates. TQNR measures the combined effect of the procedures used to handle unit and item nonresponse on the weighted ABS estimate. Detailed imputation rates are available upon request.

*Data editing.* Prior to tabulating the data, response data were reviewed and edited to correct reporting errors. R&D data were tabulated for records reporting \$50,000 or more in R&D expenditures.

Additionally, R&D data were only tabbed for records classified in the following NAICS industries:

- 31–33 – Manufacturing
- 42 – Wholesale trade
- 51 – Information



- 5413 – Architectural, engineering, and related services
- 5415 – Computer systems design and related services
- 5417 – Scientific research and development services

Survey analysts reviewed the R&D reported by the survey respondents. Research was done by evaluating the reported business descriptions, reported R&D-to-sales ratio, and company website information. The majority of corrections involved false positive reports or data reported using incorrect units (such as dollars instead of thousands of dollars). For NAICS industries 5415 and 5417, it is difficult to differentiate R&D from other technical work based solely on company website information. Due to this difficulty and the large number of companies sampled in these industries, it was not feasible to review each case individually and relatively few corrections were made for false positive reports.

Additional data errors were detected and corrected through mass corrections, and an automated data edit system was designed to review the data for reasonableness and consistency. The editing process interactively performed corrections by using standard procedures to fix detectable errors. Quality control techniques were used to verify that operating procedures were carried out as specified.

*Techniques for handling unit nonresponse.* Weighted estimates produced from the ABS include adjustments to account for companies that did not respond to the survey (unit nonresponse). Unit nonresponse is handled by adjusting weighted reported data as follows. Each company's sampling weight is multiplied by a nonresponse adjustment factor. To calculate the adjustment factors, each company in the sample that is eligible for tabulation is assigned to one (and only one) adjustment cell. The adjustment cells are based on employment size and NAICS sector. For employment size, there are five categories: 1 to 4 employees, 5 to 9 employees, 10 to 49 employees, 50 to 249 employees, and 250 or more employees. For a given adjustment cell, the nonresponse adjustment factor is the ratio of the sum of the sampling weights for all companies in the cell to the sum of the sampling weights for all companies in the cell with reported data. For the nonresponse adjustment, a business is considered a respondent if it responded to either the R&D module, innovation module, or technology module of the survey.

*Item nonresponse.* Item nonresponse for certain key items was handled by item imputation. Missing employment and demographic characteristics were imputed using administrative data where available. If no administrative data were available for demographic characteristics, data were imputed using donor imputation. For all other items, no item imputation was performed, and missing items are considered zeros for numeric totals and included in the No/NA tabulations for categorical items.

*Weighting.* The survey data are weighted for sampling as designed for the ABS. The weights were adjusted for complete nonresponse based on the ratio of the weights for the entire sample to the responding sample.

*Tabulation.* Although as many firms as possible were identified as out of scope during sampling, additional out-of-scope firms were identified with either response or updated administrative data not available at the time of sampling. These approximately 33,000 firms were removed for tabulations and include the following:

- Firms reporting zero employment
- Firms that responded as out of business before 2018
- Nonprofit organizations
- Firms that responded as being owned by a domestic parent company
- Firms with unclassified industry NAICS

*Statistical disclosure avoidance.* Statistical disclosure avoidance is accomplished using noise infusion. In this method, random noise factors are independently assigned for each respondent and incorporated in the tabulations as multiplicative factors applied to respondents' microdata. The 2019 ABS estimates have all been subjected to noise infusion. Because of the large sample size used for the ABS, the Census Bureau's Disclosure Review Board required an additional random rounding adjustment be applied to published firm counts to ensure adequate perturbation for these estimates. The adjustment for firm counts was applied independently for all cells. In some cases, the sum of detailed estimates did not equal the total. In such cases, the detailed estimates were raked to the total. The use of these techniques introduced uncertainty into the ABS estimates that is sufficient to protect the confidentiality of the respondents and their data.

*Industry classification.* The industry classifications of firms are based on the [2017 NAICS](#). Firms with more than one domestic establishment are assigned a single industry classification using a hierarchical system based on the largest payroll sector, largest payroll 3-digit NAICS (within the largest sector), largest payroll 4-digit NAICS (within the largest 3-digit), and largest payroll 6-digit NAICS (within the largest 4-digit). For tabulation, industry classification was based on administrative data for 2017.

*Geography.* Firms with establishments operating in more than one state are tabulated as unclassified and counted only once in state and national totals.

*Variance estimation.* The ABS uses the delete-a-group jackknife variance estimator. Note that certainty cases do not contribute to the sampling variance. The delete-a-group jackknife variance estimator requires that every sampling stratum contains at least two sampled firms. Sampling strata that do not meet this requirement are collapsed as needed to create a new set of variance estimation strata that satisfies this requirement.

## Survey Quality Measures

The estimates produced from the ABS are subject to both sampling and nonsampling errors.

*Sampling error.* Detailed relative standard errors may be found in the accompanying tables that are available upon request.

*Coverage error.* The ABS uses the prior year Business Register to construct the frame so any changes in businesses that would change the inclusion or exclusion of the business to the survey scope could be sources of coverage error. Prior to tabulation, information for survey units is updated with the most recent available Business Register data to mitigate this source of error.

*Nonsampling error.* Although explicit measures of the effects of these nonsampling errors are not available, adjustments are made to the published relative standard errors to account for errors associated with imputation of missing data. It is believed that most of the important operational and data errors were detected and corrected through an automated data edit designed to review the data for reasonableness and consistency. Quality control techniques were used to verify that operating procedures were carried out as specified.

*Measurement error.* The most common source of measurement error was reporting in different units (for example, reporting whole dollars rather than thousands of dollars).

## Data Comparability

Some estimates from the 2019 ABS (data year 2018) may not be comparable to similar estimates from the 2017 ABS (data year 2017) due to changes in survey methodology. Sources of possible incomparability include changes to questionnaire wording and instructions, changes to data editing and tabulation, and changes to imputation and nonresponse adjustments.

*Changes to questionnaire wording and instructions.* The survey section that collected information on R&D from businesses (Section D) had nearly identical question wording and instructions for both the ABS 2019 (data year 2018) and the ABS 2017 (data year 2017) questionnaires. The 2019 ABS collected additional detail from businesses on the location of R&D performance and explicitly highlighted the concept of “domestic R&D performance.” For the 2019 ABS, detailed questions about R&D expenditures (types of costs, funding sources, and R&D categories) were tied to domestic R&D performance (a subset of total R&D costs), whereas the 2017 ABS asked similar questions tied to total R&D costs.

The survey section that collected information that was used to produce statistics on innovation (Section C of the 2019 ABS questionnaire) had several wording, definitional, and instruction changes that differ from the 2017 ABS:

- The section title was changed from “Innovation” on the 2017 ABS to “Products and Processes” on the 2019 ABS.
- The term “innovation” was used frequently in instructions, question headings, and question wording on the 2017 ABS. The term is used less frequently on the 2019 ABS and is not highlighted in a question until after the questions used to indicate product innovation and business process innovation.
- The 2019 ABS asks questions on product innovation and business process innovation before asking any other questions. The 2017 ABS preceded these questions with questions on innovation business strategies and whether the business sold goods or services. It is possible that the preceding questions on the 2017 ABS influenced or conditioned respondents to respond differently than had they not been presented in that order. See the related item below on changes to data editing and tabulation.
- The 2017 ABS questions used to indicate process innovation differ from the 2019 ABS questions used to indicate business process innovation in number, wording, and intent. The terms appear similar, but the underlying questions and concepts are substantially different.
- The 2017 ABS asked two questions (in-house R&D and external R&D) to assess whether companies were R&D-active. The 2019 ABS asks one question (R&D) to make the same determination.

*Changes to data editing and tabulation.* For data collected in the R&D section of the ABS, the largest difference in editing between data years 2017 and 2018 was that every response with \$50,000 or more in R&D costs was reviewed for reasonableness in 2018 data year. The large sample size in the 2017 data year made this level of review impractical. For the 2017 ABS, all positive R&D cases were reviewed in industries with high rates of false-positive reports, but only cases reporting \$1,000,000 or more of R&D were reviewed in NAICS 5417 and 5415—two industries where false-positive reports are less common. Outside of the review for potential false-positive R&D cases, the editing of R&D data was performed similarly in data years 2017 and 2018.

Data collected in the innovation section of the ABS were edited similarly in data years 2017 and 2018, but the estimates for product innovation were tabulated differently. For data year 2017, a business must have responded positively to both the product innovation question and the subsequent business product innovation question (new to market or new to business) to be considered a product innovator. For data year 2018, only a positive response to the “New or Improved Goods or Services” question was required to be tabulated as a product innovator.

*Changes in imputation methods.* In the 2019 ABS (data year 2018), a change was made in how item nonresponse is treated. Item nonresponse occurs when a company responds to the survey but leaves some items blank. In the ABS 2017 (data year 2017), item nonresponse was treated using a combination of mode and donor imputation. In the ABS 2019, no imputation was performed to treat item nonresponse, and missing items were considered the same as a reported no or zero in the estimates. For the majority of the estimates (91%), this change in methods did not yield a change in the estimates. For an additional 9% of estimates, there was a difference in the estimate, but the difference was not statistically significant.

*Changes in collection methods.* In an attempt to reduce respondent burden, respondents were not asked to complete the owner section on the 2019 ABS (data year 2018) if they were in the sample for the 2017 ABS (data year 2017).

## Definitions

*Domestic or United States.* Refers to a location in any of the U.S. 50 states and the District of Columbia.

*Employment.* Paid employment consists of full- and part-time employees, including salaried officers and executives of corporations who were on the payroll in the pay period including March 12. Included are employees on sick leave, holidays, and vacations; not included are proprietors and partners of unincorporated businesses.

*Ethnicity.* Based on OMB guidance, there are two minimum categories for ethnicity: Hispanic or Latino and not Hispanic or Latino. OMB considers race and Hispanic origin to be two separate and distinct concepts. Hispanics and Latinos may be of any race.

*Firm.* A business organization or entity consisting of one or more domestic establishment locations under common ownership or control.

*Foreign parent (of a U.S.-located business).* The first entity outside the United States in an affiliate's ownership chain that has a direct or indirect investment interest of more than 50% of the affiliate's voting securities.

*Innovation.* A business innovation is a new or improved product or business process (or combination thereof) that differs significantly from the firm's previous products or business processes and that has been introduced on the market or brought into use by the firm.

*Intellectual property.* Includes patents, processes, and trade secrets; books and music; trademarks; recorded performances and events, such as radio and television programs and motion pictures; broadcast and recorded live performances and events and their content; general use computer software; franchise fees; and other (for example, digital media).

*Noise infusion.* A method of disclosure avoidance in which values are perturbed prior to tabulation by applying a random noise multiplier to the magnitude data, such as the sales and receipts for all firms. Disclosure protection is accomplished in a manner that causes the vast majority of cell values to be perturbed by, at most, a few percentage points.

*North American Industry Classification System (NAICS).* NAICS is the standard used by federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. This system is used by the United States, Canada, and Mexico.

*Race.* The data on race were derived from answers to the race question. Race data are collected in accordance with the guidelines provided by OMB, and these data are based on self-identification. The racial categories included in the questionnaire generally reflect a social definition of race recognized in this country and not an attempt to define race biologically, anthropologically, or genetically. In addition, it is recognized that the categories of the race question include race and national origin or sociocultural groups. OMB requires that race data be collected for a minimum of five groups: White, Black or African American, American Indian or Alaska Native, Asian, and Native Hawaiian or other Pacific Islander. Respondents may report more than one race.

*Receipts.* Includes the total sales, shipments, receipts, revenue, or grants for domestic operations, excluding foreign subsidiaries.

*Research and development (R&D).* R&D is planned, creative work aimed at discovering new knowledge or devising new applications of available knowledge. This includes (1) activities aimed at acquiring new knowledge or understanding without specific immediate commercial applications or uses (basic research); (2) activities aimed at solving a specific problem or meeting a specific commercial objective (applied research); and (3) systematic use of research and practical experience and resulting in additional knowledge, which is directed to producing new or improved goods, services, or processes (development). R&D includes both direct costs, such as salaries of researchers and administrative and

overhead costs clearly associated with the company's R&D. However, R&D does not include expenditures for routine product testing, quality control, and technical services unless they are an integral part of an R&D project. R&D also does not include market research; efficiency surveys or management studies; literary, artistic, or historical projects, such as films, music, or books and other publications; and prospecting or exploration for natural resources.

**Sex.** For the purposes of the ABS, sex refers to a person's biological sex. The sex question wording very specifically intends to capture a person's biological sex and not gender.

**Worldwide sales.** Worldwide and domestic sales and operating revenues, including grants.

## Technical Tables

---

Table	Title
-------	-------

<a href="#">A-1</a>	Companies in the target population and selected for the sample, by industry: 2018
---------------------	---

---

<a href="#">A-2</a>	Response measures: 2018
---------------------	-------------------------

---

<a href="#">A-3</a>	Unit response rates, by industry: 2018
---------------------	--

---

TABLE A-1

**Companies in the target population and selected for the sample, by industry: 2018**

(Number of companies)

Industry	NAICS code	Companies in target population <sup>a</sup>	Companies selected for the sample		
			All companies	Noncertainties	Certainties
All industries	11, 21–23, 31–33, 42–81	5,260,000	297,000	255,000	41,500
Manufacturing industries	31–33	237,000	52,500	41,500	11,000
Food	311	22,000	5,300	4,100	1,200
Beverage and tobacco products	312	8,400	2,700	2,200	450
Textile, apparel, and leather products	313–16	13,000	2,900	2,300	550
Wood products	321	11,500	2,400	1,900	500
Paper	322	2,300	550	250	300
Printing and related support activities	323	22,500	4,700	4,000	650
Petroleum and coal products	324	750	200	80	100
Chemicals	325	8,900	3,300	2,400	850
Pesticide, fertilizer, and other agricultural chemical	3253	600	200	150	50
Pharmaceuticals and medicines	3254	1,800	1,000	700	300
Soap, cleaning compound, and toilet preparation	3256	2,000	650	550	100
Other chemicals	other 325	4,600	1,500	1,100	400
Plastic and rubber products	326	8,500	2,300	1,700	600
Nonmetallic mineral products	327	8,800	2,400	1,800	550
Primary metals	331	3,000	1,200	850	350
Fabricated metal products	332	48,000	6,200	5,200	950
Machinery	333	19,500	3,300	2,500	750
Computer and electronic products	334	9,900	3,800	2,900	900
Communications equipment	3342	1,100	500	350	150
Semiconductor and other electronic components	3344	3,200	1,200	850	300
Navigational, measuring, and control instruments	3345	4,000	1,500	1,100	350
Other computer and electronic products	other 334	1,700	650	500	150
Electrical equipment, appliances, and components	335	4,400	1,600	1,200	350
Transportation equipment	336	8,700	2,900	2,000	850
Automobiles, bodies, trailers, and parts	3361–63	5,200	1,500	1,000	500
Aerospace products and parts	3364	1,200	700	500	200
Other transportation	other 336	2,300	650	500	150
Furniture and related products	337	13,500	2,900	2,400	500
Miscellaneous	339	23,000	4,300	3,700	600
Medical equipment and supplies	3391	8,700	1,700	1,400	250
Other miscellaneous manufacturing	3399	14,000	2,600	2,200	350
Nonmanufacturing industries	11, 21–23, 42–81	5,020,000	244,000	213,000	30,500
Agriculture, forestry, fishing and hunting	11	26,000	950	750	200
Mining, extraction, and support activities	21	18,500	2,900	2,200	650
Utilities	22	3,400	1,400	1,000	400
Construction	23	659,000	21,500	20,000	1,300
Wholesale trade	42	282,000	18,500	15,500	2,900
Retail trade	44–45	600,000	22,000	19,500	2,600
Transportation and warehousing	48–49	170,000	13,500	11,500	2,100
Information	51	69,000	16,000	13,000	3,100
Publishing	511	18,500	4,700	3,700	950

TABLE A-1

**Companies in the target population and selected for the sample, by industry: 2018**

(Number of companies)

Industry	NAICS code	Companies in target population <sup>a</sup>	Companies selected for the sample		
			All companies	Noncertainties	Certainties
Newspaper, periodical, book, and directory publishers	5111	10,500	2,600	2,200	400
Software publishers	5112	7,800	2,100	1,500	550
Telecommunications	517	10,500	2,900	2,200	650
Data processing, hosting, and related services	518	8,600	2,900	2,300	600
Other information	other 51	31,500	5,700	4,700	950
Finance and insurance	52	222,000	8,100	6,800	1,300
Real estate and rental and leasing	53	293,000	9,900	9,400	450
Lessors of nonfinancial intangible assets (except copyrighted works)	533	2,100	90	70	20
Other real estate and rental and leasing	other 53	291,000	9,800	9,400	400
Professional, scientific, and technical services	54	762,000	58,000	50,500	7,700
Legal services	5411	164,000	8,400	7,600	800
Accounting, tax preparation, bookkeeping, and payroll services	5412	107,000	5,300	4,900	400
Architectural, engineering, and related services	5413	88,500	10,500	9,200	1,400
Specialized design services	5414	31,000	1,400	1,300	50
Computer and electronic products	5415	113,000	10,000	8,000	2,000
Management, scientific, and technical consulting services	5416	152,000	7,800	6,800	1,000
Scientific research and development services	5417	12,500	5,300	4,400	850
Advertising, public relations, and related services	5418	32,000	6,300	5,400	900
Other professional, scientific, and technical services	5419	61,500	3,100	2,800	250
Management of companies and enterprises	55	3,300	150	100	50
Administrative and support and waste management and remediation services	56	317,000	12,500	10,000	2,500
Educational services	61	64,000	2,300	2,100	200
Health care and social assistance	62	569,000	21,000	18,500	2,500
Health care services	621–23	484,000	18,000	16,000	2,200
Social assistance	624	84,500	3,100	2,800	250
Arts, entertainment, and recreation	71	100,000	3,700	3,300	400
Accommodation and food services	72	496,000	19,000	17,000	2,000
Other services	81	366,000	12,500	12,000	250

NAICS = 2017 North American Industry Classification System.

<sup>a</sup> Estimates of the number of companies in the target population are based on the original sampling frame that was created to select the 2019 Annual Business Survey. Numbers are rounded.

**Note(s):**

Certainties were companies with a probability of selection of 1 because they had \$1 million or more in R&D costs in the 2016 Business R&D and Innovation Survey–Microbusiness, they had 500 or more employees, or they had high payroll or receipts defined by stratum-specific cutoffs. Noncertainties are companies with a probability of selection of less than 1. Approximately 3,500 companies were selected for the sample with an unclassified NAICS industry.

**Source(s):**

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



TABLE A-2

**Response measures: 2018**

(Percent)

Measure	2019
Check-in rate <sup>a</sup>	72.9
Response rate (unweighted) <sup>b</sup>	71.8

<sup>a</sup> The number of survey responses from sampled companies, divided by the total number of companies in the sample. Note that this includes companies that contacted the Census Bureau to indicate they were out of business and companies that were later determined to be inactive or otherwise out of scope for tabulations.

<sup>b</sup> The number of active and in-scope companies responding to the number of owners and number of W2 employees, divided by the total number of in-scope and active companies in the sample.

**Source(s):**

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

TABLE A-3

**Unit response rates, by industry: 2018**

(Number and percent)

Industry	NAICS code	Active reporting units <sup>a</sup>	Reporting units that met the response criteria (%)
All industries	11, 21–23, 31–33, 42–81	267,000	71.8
Manufacturing industries	31–33	48,000	71.9
Food	311	4,800	67.0
Beverage and tobacco products	312	2,400	72.7
Textile, apparel, and leather products	313–16	2,600	68.8
Wood products	321	2,200	70.4
Paper	322	500	67.8
Printing and related support activities	323	4,300	71.8
Petroleum and coal products	324	150	70.0
Chemicals	325	2,900	71.0
Pesticide, fertilizer, and other agricultural chemical	3253	200	66.7
Pharmaceuticals and medicines	3254	850	67.9
Soap, cleaning compound, and toilet preparation	3256	600	73.4
Other chemicals	other 325	1,300	72.6
Plastic and rubber products	326	2,100	74.3
Nonmetallic mineral products	327	2,100	70.3
Primary metals	331	1,100	69.5
Fabricated metal products	332	5,700	76.1
Machinery	333	2,900	73.6
Computer and electronic products	334	3,400	74.0
Communications equipment	3342	400	73.7
Semiconductor and other electronic components	3344	1,000	73.2
Navigational, measuring, and control instruments	3345	1,400	76.1
Other computer and electronic products	other 334	600	70.7
Electrical equipment, appliances, and components	335	1,400	72.9
Transportation equipment	336	2,600	70.1
Automobiles, bodies, trailers, and parts	3361–63	1,400	71.8
Aerospace products and parts	3364	600	68.9
Other transportation	other 336	550	66.9
Furniture and related products	337	2,700	73.1
Miscellaneous	339	3,900	73.4
Medical equipment and supplies	3391	1,500	73.3
Other miscellaneous manufacturing	3399	2,400	73.5
Nonmanufacturing industries	11, 21–23, 42–81	219,000	71.7
Agriculture, forestry, fishing and hunting	11	750	73.2
Mining, extraction, and support activities	21	2,500	71.0
Utilities	22	1,100	72.6
Construction	23	19,500	72.4
Wholesale trade	42	16,500	71.6
Retail trade	44–45	20,000	66.6
Transportation and warehousing	48–49	12,000	67.0
Information	51	14,000	69.4
Publishing	511	4,100	70.4
Newspaper, periodical, book, and directory publishers	5111	2,300	71.1
Software publishers	5112	1,800	69.7
Telecommunications	517	2,500	56.8

TABLE A-3

**Unit response rates, by industry: 2018**

(Number and percent)

Industry	NAICS code	Active reporting units <sup>a</sup>	Reporting units that met the response criteria (%)
Data processing, hosting, and related services	518	2,600	74.5
Other information	other 51	4,800	72.3
Finance and insurance	52	7,200	79.3
Real estate and rental and leasing	53	8,600	72.0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	70	65.7
Other real estate and rental and leasing	other 53	8,600	72.1
Professional, scientific, and technical services	54	52,500	78.5
Legal services	5411	7,900	79.0
Accounting, tax preparation, bookkeeping, and payroll services	5412	4,900	81.0
Architectural, engineering, and related services	5413	9,800	83.4
Specialized design services	5414	1,200	81.4
Computer and electronic products	5415	8,900	76.6
Management, scientific, and technical consulting services	5416	6,900	77.7
Scientific research and development services	5417	4,600	71.8
Advertising, public relations, and related services	5418	5,700	76.6
Other professional, scientific, and technical services	5419	2,800	76.8
Management of companies and enterprises	55	100	67.9
Administrative and support and waste management and remediation services	56	11,500	70.6
Educational services	61	1,900	71.7
Health care and social assistance	62	19,000	73.0
Health care services	621–23	16,500	73.9
Social assistance	624	2,400	67.6
Arts, entertainment, and recreation	71	3,200	70.5
Accommodation and food services	72	17,500	60.4
Other services	81	11,500	68.3

NAICS = 2017 North American Industry Classification System.

<sup>a</sup> Active reporting units are defined as reporting units of active companies that are in the scope of the survey after all data have been processed.<sup>b</sup> Reporting units were considered to have fulfilled the response criteria if they provided the number of owners and number of W-2 employees.**Source(s):**

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

## Acknowledgments and Suggested Citation

---

### Acknowledgments

Audrey E. Kindlon of the National Center for Science and Engineering Statistics (NCSES) developed and coordinated this report under the guidance of John Jankowski, NCSES Program Director, and under the leadership of Emilda B. Rivers, NCSES Director; Vipin Arora, NCSES Deputy Director; and Matt Williams, Acting NCSES Chief Statistician. In partnership with NCSES, the Census Bureau conducted the survey and prepared the tables. NCSES staff members who made significant contributions include Gary Anderson, Jock Black, Jennifer Beck, Rebecca Morrison, and Timothy Wojan.

The Census Bureau, under National Science Foundation interagency agreement number NCSE-1748418, collected, processed, evaluated, and tabulated the data for this report. The Annual Business Survey is conducted within the Economic Directorate of the Census Bureau under the direction of Nick Orsini, Associate Director for Economic Programs, and Samuel Jones, Assistant Director for Economic Programs.

The data were prepared in the Economic Reimbursable Surveys Division under the direction of Kevin Deardorff, Division Chief, and Aneta Erdie, Assistant Division Chief. This work was performed under the supervision of Patrice Hall, assisted by John Clark, Lakitquana Leal, and Gail White, with staff assistance from Ahmad Bakhshi, Elaine Emanuel, Mary Frauenfelder, Aaron Finkle, Samantha Hernandez, James Jarzabkowski, Jessica Welch, and Tesfay Weldu. Additional support, including table creation and subject matter expertise was provided by Brandon Shackelford.

Mathematical and statistical techniques were provided by the Economic Statistical Methods Division under the direction of Carol Caldwell, Division Chief, and James Hunt, Assistant Division Chief. This work was performed under the supervision of Roberta Kurec, assisted by Sandra Peterson, with staff support from Taylor Beebe, Alexandra Abzun Cadenas, Charles Champion, and Daniel Cordes.

Data collection procedures and operations were provided by the Economic Management Division under the direction of Lisa Donaldson, Division Chief, and Michelle Karlsson, Assistant Division Chief. The staff of the National Processing Center performed mailout preparation, respondent assistance, and correspondence processing. Project management support was provided by Laura Hardesty.

Development and coordination of the computer processing system was provided by the Economic Application Division under the direction of Sumit Khaneja, Division Chief. This work was performed by Marilyn Balogh, Michael Feldman, David Gonzalez, Chakravarthy Sharad, and Joseph Talbot.

Publication processing support was provided by Devi Mishra, Catherine Corlies, and Tanya Gore (NCSES).

### Suggested Citation

National Center for Science and Engineering Statistics (NCSES). 2022. *Annual Business Survey: 2019 (Data Year 2018)*. NSF 22-315. Alexandria, VA: National Science Foundation. Available at <https://nces.gov/pubs/nsf22315/>.

## Contact Us

---

### Report Author

Audrey E. Kindlon  
Survey Manager  
Research and Development Statistics Program, NCSES  
Tel: (703) 292-2332  
E-mail: [akindlon@nsf.gov](mailto:akindlon@nsf.gov)

### NCSES

National Center for Science and Engineering Statistics  
Directorate for Social, Behavioral and Economic Sciences  
National Science Foundation  
2415 Eisenhower Avenue, Suite W14200  
Alexandria, VA 22314  
Tel: (703) 292-8780  
FIRS: (800) 877-8339  
TDD: (800) 281-8749  
E-mail [ncsesweb@nsf.gov](mailto:ncsesweb@nsf.gov)