

Georgia Tech Survey of Advanced Technology and Robotics in U.S. Manufacturing

A study by the Georgia Institute of Technology to understand the use of robotics and advanced technology in manufacturing in the United States.

Your participation will help to make this study a success.



This study is conducted by the Georgia Institute of Technology and funded by the National Science Foundation (NSF), with survey data collection being conducted by NORC at the University of Chicago.



Survey Instructions

Please mark your response with an “X” using blue or black ink, as in the example below:

Right Way



Wrong Way



Frequently Asked Questions

Why am I receiving this survey?

Your establishment's address was selected at random to learn more about the robotics industry in the United States.

Who is conducting the survey?

This study is funded by Georgia Tech University with survey data collection being conducted by NORC at the University of Chicago.

How long will this survey take?

This survey takes about 15 minutes to complete. Please note that participation is voluntary and you will be able to skip any of the questions.

Will my information be kept private and confidential?

The information you provide will be used for statistical purposes only. We will do our best to protect the confidentiality of all the information we collect from you and we will not disclose your information to third parties.

My establishment is no longer in business. What should I do?

Complete the survey with data for any period of time during the last calendar year that the establishment was in operation.

Are estimates acceptable?

Yes, estimates are acceptable if book figures are not readily available.

I am a very small business. Why do you want information from me?

Taken together, small businesses have a real impact on the economy. Your establishment was chosen from a scientifically selected sample of businesses and represents many other small businesses like yours.

If you encounter any difficulties during the survey or if you would like more information about the study, please call us toll free at 1-888-493-5957 or send an email to GA_RoboticsSurvey@norc.org.

A. Background and Establishment Info

- 1** Please provide information about the main individual completing this questionnaire.
Without this information, we cannot send you a link to the dashboard with survey results in the future.

a. Job Title:

b. Name:

c. Email:

d. When did this establishment begin operations?

- ☐ 1999 or earlier
☐ Between 2000 and 2009
☐ 2010
☐ 2011
☐ 2012
☐ 2013
☐ 2014
☐ 2015
☐ 2016
☐ 2017
☐ Prefer not to respond

- 2** Is this establishment a production facility (i.e. does manufacturing take place here)?

- ☐ Yes → Please continue to Question 3
☐ No → You have reached the end of the survey.
Please go to Page 8 for instructions to mail in your survey. Thank you.

- 3** What is your primary manufacturing sector? Please choose the most appropriate detailed level from the list to the right. If the sector code is 3 digits, please enter a 0 in the first box.

If your primary manufacturing sector is not represented in the list, please specify the sector below.

- 4** What is your secondary manufacturing sector? Please choose the most appropriate detailed level from the list to the right. If the sector code is 3 digits, please enter a 0 in the first box.

If your secondary manufacturing sector is not represented in the list, please specify the sector below.

Manufacturing Sectors for Questions 3 and 4:

- 311 Food Manufacturing
- 312 Beverage and Tobacco Product Manufacturing
- 313 Textile Mills
- 314 Textile Product Mills
- 315 Apparel Manufacturing
- 316 Leather and Allied Product Manufacturing
- 321 Wood Product Manufacturing
- 322 Paper Manufacturing
- 323 Printing and Related Support Activities
- 324 Petroleum and Coal Products Manufacturing
- 325 Chemical Manufacturing
- 326 Plastic and Rubber Products Manufacturing
- 327 Nonmetallic Mineral Product Manufacturing
- 331 Primary Metal Manufacturing
- 332 Fabricated Metal Product Manufacturing
- 333 Machinery Manufacturing
- 334 Computer and Electronic Product Manufacturing
- 3341 Computer and Peripheral Equipment Manufacturing
- 3342 Communications Equipment Manufacturing
- 3343 Audio and Video Equipment Manufacturing
- 3344 Semiconductor and other Electronic Component Manufacturing
- 3345 Navigational, Measuring, Electromedical, and Control Instruments Manufacturing
- 3346 Manufacturing and Reproducing Magnetic Optical Media
- 335 Electrical Equipment, Appliance, and Component Manufacturing
- 336 Transportation Equipment Manufacturing
- 3361 Motor Vehicle Manufacturing
- 3362 Motor Vehicle Body and Trailer Manufacturing
- 3363 Motor Vehicle Parts Manufacturing
- 3364 Aerospace Product and Parts Manufacturing
- 3365 Railroad and Rolling Stock Manufacturing
- 3366 Ship and Boat Building
- 3369 Other Transportation Equipment Manufacturing
- 337 Furniture and Related Product Manufacturing
- 339 Miscellaneous Manufacturing

5 What top three products does your establishment make?
Please provide the name of the product, not the brand name.

a. Product 1:

b. Product 2:

☐ Not applicable

c. Product 3:

☐ Not applicable

6 Did this establishment move within the last five years?

☐ Yes → Proceed to 6a

☐ No → Skip to 7

a If YES, what was the address five years ago? If you do not know the exact street address of the previous location, please enter as much information as you are able.

b How many square feet in total was the building (or campus) occupied five years ago? Please provide an estimate if exact numbers are not available. Please enter a value between 0 and 99,999,999.

 ft²

7 How many square feet in total is the current building (or campus)?

 ft²

8 Has any portion of this establishment's production work been relocated to a non-U.S. location since 2010 (i.e. has any work been off-shored)?

☐ Yes

☐ No

a If YES, to what country was production relocated?

9 Has any portion of this establishment's current production work been relocated from a non-U.S. location since 2010 (i.e. has any work been re-shored)?

☐ Yes

☐ No

a If YES, from what country was production relocated?

B. Robots and Other Production Technology

10a Compared to establishments in your primary manufacturing sector, what is your establishment's production volume?

- ☐ Small batch production
- ☐ Somewhat small batch production
- ☐ Medium volume production
- ☐ Somewhat high volume production
- ☐ High volume production

10b Compared to establishments in your primary manufacturing sector, how flexible are your establishment's production operations?

- ☐ Not flexible
- ☐ Slightly flexible
- ☐ Moderately flexible
- ☐ Flexible
- ☐ Highly flexible

10c Compared to establishments in your primary manufacturing sector, how design-intensive are the products made at your establishment? For reference, printer paper is a product with very low design-intensity, while luxury cars have high design-intensity.

- ☐ Not design-intensive
- ☐ Slightly design-intensive
- ☐ Moderately design-intensive
- ☐ Design-intensive
- ☐ Highly design-intensive

11 In general, on what basis do products made at your establishment compete with similar products made at other establishments? Please select only one.

- ☐ Price (i.e. lowest cost)
- ☐ Product differentiation (i.e. uniqueness, quality, or prestige)
- ☐ Both price and product differentiation equally
- ☐ None of the above

12 What types of advanced automation are in use at this establishment?

Please respond yes or no to each automation type. Please reference the *Robotics Survey Terms* included in this booklet for definitions and examples.

	Yes	No
a. Rapid Prototyping (not including additive manufacturing or 3-D printing)	<input type="checkbox"/>	<input type="checkbox"/>
b. Additive Manufacturing or 3-D printing (for any use, including prototyping)	<input type="checkbox"/>	<input type="checkbox"/>
c. Computer Aided Design/Computer Aided Manufacturing (CAD/CAM)	<input type="checkbox"/>	<input type="checkbox"/>
d. Sensors, machine vision, or other real-time monitoring	<input type="checkbox"/>	<input type="checkbox"/>
e. Advanced materials (e.g. nano-materials, bio-materials, composites)	<input type="checkbox"/>	<input type="checkbox"/>
f. Computer Numeric Controlled (CNC) machines or machine tools	<input type="checkbox"/>	<input type="checkbox"/>
g. Robots (includes traditional industrial robots, collaborative robots, or mobile robots/autonomous guided vehicles. Please reference the <i>Robotics Survey Terms</i> included in this booklet for definitions and examples).	<input type="checkbox"/>	<input type="checkbox"/>

g1 If YES, when did your establishment purchase its first robot or group of robots?

- ☐ 0-4 years ago
- ☐ 5-9 years ago
- ☐ 10 years ago or more

If NO, please skip to first question in Section D on Page 6.

- 13** How many of each brand of traditional industrial robot is in use at your establishment? Please reference the *Robotics Survey Terms* included in this booklet for pictures and description of traditional industrial robots. Please provide an estimate if exact numbers are not available. If you do not know the brand of the robots, please write the number in the "unknown" category. You may leave the box blank to indicate "zero."

	Number of robots
a. ABB	<input type="text"/>
b. Comau	<input type="text"/>
c. Denso	<input type="text"/>
d. Epson	<input type="text"/>
e. Fanuc	<input type="text"/>
f. Kuka	<input type="text"/>
g. Mitsubishi	<input type="text"/>
h. Nachi	<input type="text"/>
i. Staubli	<input type="text"/>
j. Yaskawa Motoman	<input type="text"/>
l. Unknown	<input type="text"/>
k. Other, please specify:	<input type="text"/>
	<input type="text"/>

- 14** Do your robots at your establishment perform any of the following applications?

Please respond yes or no to each automation type.

	Yes	No
a. Machine tending	<input type="checkbox"/>	<input type="checkbox"/>
b. Welding and soldering	<input type="checkbox"/>	<input type="checkbox"/>
c. Dispensing (e.g. paint or adhesive)	<input type="checkbox"/>	<input type="checkbox"/>
d. Processing (e.g. cutting or grinding)	<input type="checkbox"/>	<input type="checkbox"/>
e. Assembling or disassembling	<input type="checkbox"/>	<input type="checkbox"/>
f. Cleanroom functions	<input type="checkbox"/>	<input type="checkbox"/>
g. Storage, location, and retrieval	<input type="checkbox"/>	<input type="checkbox"/>
h. Other, please specify:	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="text"/>	

- 15** How many collaborative robots are in use in your establishment? Collaborative robots share workspaces and directly interact with humans. They are typically small and have light payloads. Please reference the *Robotics Survey Terms* included in this booklet for pictures and further description of collaborative robots.

- ☐ 0 → Skip to 17
☐ 1-5 → Proceed to 16
☐ 6 or more → Proceed to 16

- 16** If collaborative robots are in use at your establishment, what applications do the collaborative robots perform?

	Yes	No
a. Machine tending	<input type="checkbox"/>	<input type="checkbox"/>
b. Welding and soldering	<input type="checkbox"/>	<input type="checkbox"/>
c. Dispensing (e.g. paint or adhesive)	<input type="checkbox"/>	<input type="checkbox"/>
d. Processing (e.g. cutting or grinding)	<input type="checkbox"/>	<input type="checkbox"/>
e. Assembling or disassembling	<input type="checkbox"/>	<input type="checkbox"/>
f. Cleanroom functions	<input type="checkbox"/>	<input type="checkbox"/>
g. Storage, location, and retrieval	<input type="checkbox"/>	<input type="checkbox"/>
h. Other, please specify:	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="text"/>	

- 17** How many mobile robots are in use at your establishment? Mobile robots are autonomous vehicles that guide themselves by sensing their environment. Please reference the *Robotics Survey Terms* included in this booklet for pictures and further description of mobile robots. Please provide an estimate if exact numbers are not available. Please enter a value between 0 and 100,000.

robots

- 18** Compared to 2010, do you have more robots in use in your establishment now? If your establishment started after 2010, please use the initial year as the starting point for this question.

- ☐ Yes
☐ No

C. Development, Installation, Maintenance

- 19** Which of the following groups provides **robot integration** services for your establishment? Robotics integration encompasses the processes involving design, manufacture, and installation of production systems involving robotics. This may include designing a new workcell or production line from scratch, incorporating robots into an existing set of production operations, or modifying existing robotic work processes.

	Yes	No
a. In-house staff	<input type="checkbox"/>	<input type="checkbox"/>
b. Independent Systems Integrator	<input type="checkbox"/>	<input type="checkbox"/>
c. Other, please specify:	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="text"/>	

- b1** You indicated that an Independent Systems Integrator provides **robot integration** services. What is the location of the firm that provides the majority of these services? Please be as specific as possible.

City:

County:

State/Province:

Country:

- 20** Which of the following groups provides robot maintenance or repair services for your establishment?
Robotics maintenance is the routine and as-needed upkeep of industrial robots. This includes testing, calibration, repairing, troubleshooting, and scheduled maintenance.

	Yes	No
a. In-house staff	<input type="checkbox"/>	<input type="checkbox"/>
b. Independent Systems Integrator	<input type="checkbox"/>	<input type="checkbox"/>
c. Other, please specify:	<input type="checkbox"/>	<input type="checkbox"/>

- b1** You indicated that an Independent Systems Integrator provides robot maintenance or repair services. What is the location of the firm that provides the majority of these services? Please be as specific as possible.

City:

County:

State/Province:

Country:

D. Employment, Education, Skills, and Wages

For this section, please reference the [Robotics Survey Terms](#) included in this booklet for definitions of employee groups.

These questions refer to in-house employees, not contractual workers, except temporary workers where specified.

- 21** How many of each type of employee worked at the establishment in March 2017 and March 2010?
 Please enter 0 if the establishment did not exist in 2010. If exact numbers are not available, please use best estimates. Please enter a value between 0 and 100,000.

	Number of Employees in MARCH 2017	Number of Employees in MARCH 2010
a. Production Employees	<input type="text"/>	<input type="text"/>
b. Maintenance, Installation and Repair Employees	<input type="text"/>	<input type="text"/>
c. Engineering Technicians and Technologists	<input type="text"/>	<input type="text"/>
d. Management and Administration Permanent Employees	<input type="text"/>	<input type="text"/>
e. Temporary Employees from staffing agencies (all types)	<input type="text"/>	<input type="text"/>

- 22** What are the average hourly wages of production employees?
 Please enter a value between \$0.00 and \$100.00.

\$

- 23** What are the average hourly wages of maintenance, installation, and repair employees?
 Please enter a value between \$0.00 and \$100.00.

\$

- 24** What are the average hourly wages of engineering technicians and technologists?

Please enter a value between \$0.00 and \$100.00.

\$

- 25** What are the average hourly wages of temporary employees?

Do not include fees paid to staffing agencies; only include wages paid to workers. Please enter a value between \$0.00 and \$100.00.

\$

- 26** Since 2010, how have hourly wages changed for...

Employee Type	Increased	Stayed the same	Decreased
a. Production Employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If INCREASED, by how much have <u>hourly</u> wages changed since 2010?			
<input type="checkbox"/> \$2 or less <input type="checkbox"/> \$2.01 to \$2.50 <input type="checkbox"/> \$2.50 or more			
b. Maintenance, Installation, and Repair Employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If INCREASED, by how much have <u>hourly</u> wages changed since 2010?			
<input type="checkbox"/> \$2 or less <input type="checkbox"/> \$2.01 to \$2.50 <input type="checkbox"/> \$2.50 or more			
c. Engineering Technicians and Technologists	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If INCREASED, by how much have <u>hourly</u> wages changed since 2010?			
<input type="checkbox"/> \$2 or less <input checked="" type="checkbox"/> \$2.01 to \$2.50 <input type="checkbox"/> \$2.50 or more			
d. Temporary Employees (hired from staffing agency)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If INCREASED, by how much have <u>hourly</u> wages changed since 2010?			
<input type="checkbox"/> \$2 or less <input type="checkbox"/> \$2.01 to \$2.50 <input type="checkbox"/> \$2.50 or more			

- 27** Considering employees you have hired since 2010, which of the following educational categories do production employees most commonly fall into?

- ☐ Some high school, but did not graduate
☐ High school graduate or GED (no trade, technical, or vocational training)
☐ High school graduate or GED (with trade, technical, or vocational training)
☐ Some college but no credential
☐ Associates degree or certificate
☐ 4-year college degree
☐ Graduate degree

28 Considering employees you have hired since 2010, which of the following educational categories do maintenance, installation, and repair employees most commonly fall into?

- ☐ Some high school, but did not graduate
- ☐ High school graduate or GED (no trade, technical, or vocational training)
- ☐ High school graduate or GED (with trade, technical, or vocational training)
- ☐ Some college but no credential
- ☐ Associates degree or certificate
- ☐ 4-year college degree
- ☐ Graduate degree

29 Considering employees you have hired since 2010, which of the following educational categories do engineering technicians and technologists most commonly fall into?

- ☐ Some high school, but did not graduate
- ☐ High school graduate or GED (no trade, technical, or vocational training)
- ☐ High school graduate or GED (with trade, technical, or vocational training)
- ☐ Some college but no credential
- ☐ Associates degree or certificate
- ☐ 4-year college degree
- ☐ Graduate degree

30 Between 2010 and 2017, how have requirements for the following skills changed for production employees?

Production Employees	Increased	Stayed the same	Decreased
a. Reading	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Writing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Math	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Basic Computer Skills (e.g. word processing, spreadsheets, email)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Automation Technology (e.g. robotics, CAD/CAM, machine tools)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Communication	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Teamwork/cooperation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Problem Solving	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

31 Between 2010 and 2017, how have requirements for the following skills changed for maintenance, installation, and repair employees?

Maintenance, Installation, and Repair Employees	Increased	Stayed the same	Decreased
a. Reading	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Writing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Math	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Basic Computer Skills (e.g. word processing, spreadsheets, email)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Automation Technology (e.g. robotics, CAD/CAM, machine tools)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Communication	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Teamwork/cooperation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Problem Solving	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

32 Between 2010 and 2017, how have requirements for the following skills changed for engineering technicians and technologists?

Engineering Technicians and Technologists	Increased	Stayed the same	Decreased
a. Reading	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Writing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Math	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Basic Computer Skills (e.g. word processing, spreadsheets, email)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Automation Technology (e.g. robotics, CAD/CAM, machine tools)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Communication	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Teamwork/cooperation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Problem Solving	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

33 How difficult is it for your establishment to hire the following types of employees?

Type of Employees	Not at all difficult	Somewhat difficult	Very difficult
a. Production Employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Maintenance, Installation, and Repair Employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Engineering Technicians and Technologists	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

34 Do you conduct targeted recruiting for new employees with robotics skills?

- ☐ Yes → Proceed to 34a
- ☐ No → Skip to 35

a If YES, where do you recruit?
Check all that apply.

- ☐ High School
- ☐ Community college
- ☐ Private trade or vocational school
- ☐ Four-year college or university
- ☐ Industry trade association
- ☐ Other for-profit or non-profit training providers
- ☐ Other, please specify:

b If there are multiple sources of employees above, which do you feel provides the most qualified candidates, specifically as it pertains to robotics?

- ☐ High School
- ☐ Community college
- ☐ Private trade or vocational school
- ☐ Four-year college or university
- ☐ Industry trade association
- ☐ Other for-profit or non-profit training providers
- ☐ Other, please specify:

35 Do you think that educational institutions are providing adequate robotics training, in terms of...

Yes No

- a. Number of students they are able to train ☐ ☐
- b. Quality of training ☐ ☐

36 Are any of your employees unionized?

- ☐ Yes
☐ No

a If YES, which union(s)?

E. Expenditures

If exact numbers are not available, please provide best estimates.

37 What was the total amount spent on automation systems over the last five years? (including physical equipment, machines, robots, engineering, consulting, maintenance, or installation services, and software)

\$

38 What was the total amount spent on robot equipment over the last five years? (including physical robots, auxiliary equipment such as end of arm tools, and robot-specific software, but not integration services)

\$

39 What was the total amount spent on robot integration services over the last five years? (Robotics integration encompasses the processes involving design, manufacture, and installation of production systems involving robotics. This may include designing a new workcell or production line from scratch, incorporating robots into an existing set of production operations, or modifying existing robotic work processes.)

\$

F. Output

Please report the following information for the calendar year. If calendar year book figures are not available, please provide an estimate.

40 What was the total value of sales, shipments, receipts or revenues?

a. In 2010?

\$

b. The most recent calendar year (2017)?

\$

41 What was the value of products exported outside of the U.S.?

a. In 2010?

\$

b. The most recent calendar year (2017)?

\$

42 Is there anything you would like to share regarding your experiences with implementing or using robots?

Thank You

This is the end of the survey. Thank you very much for your contribution and providing valuable information about the robotics industry in the United States.

MAILING INSTRUCTIONS

Please place the completed questionnaire into the postage-paid return envelope.
If the envelope has been misplaced, please mail the questionnaire to:

NORC at the University of Chicago
55 E. Monroe Street, 19th Floor
Chicago Illinois 60603

If you would like more information about the study, please call 1-888-493-5957 or email GA_RoboticsSurvey@norc.org for assistance. If you have questions about your rights as a survey participant, you may call the NORC Institutional Review Board Administrator (toll-free) at 1-866-309-0542.