JANUARY 2018

Key Skills for the Future:
Data Analytics and Cybersecurity

A View From the Work Force Entry Point

NACE CENTER FOR CAREER DEVELOPMENT AND TALENT ACQUISITION

A joint research project in partnership with the Business-Higher Education Forum

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Research conducted by Edwin W. Koc

Introduction

In conjunction with the Business-Higher Education Forum (BHEF), the NACE Center for Career Development and Talent Acquisition (NACE Center) undertook a research project to explore how those in the C-suite and those directly involved in the promotion and recruitment of college graduates view two skill sets likely to be critical in the future economy: data science and analytics* and cybersecurity.

For purposes of the project, "data science and analytics skills" were defined as the skills needed to discover, interpret, and communicate meaningful patterns in data; "cybersecurity" was defined as the protection or defense of information and communications systems and the data they hold against damage, unauthorized use, modification, or exploitation.

The NACE Center's findings, presented here, reflect the views of those tasked with recruiting new college graduates for entry-level roles and those who prepare college students for entry into the world of work. The NACE Center conducted two surveys among the membership of the National Association of Colleges and Employers: Surveys were sent to 900 university relations and recruiting (URR) members and 1,600 college career services members. The surveys were open November 28, 2016, through March 17, 2017; a total of 66 URR members and 220 career services members responded. *(Note: BHEF's results, which reflect the views of C-suite executives, are available through Investing in Data Science. The report is available on the NACE website.)*

The responses to the surveys, though small and disappointing, are instructive: The overall lack of response coupled with a substantial number of incomplete responses indicate that there is very little awareness of programmatic issues surrounding the data analytics and cybersecurity skill sets among those directly involved in recruiting these at the university level. *(Note: Percents may not total 100 due to rounding.)*

* "Data analytics" is used throughout the text to refer to data science and analytics.

Highlights

Responses from URR professionals suggest the following:

- The impact of hiring those with data analytics skill sets is expected to be felt primarily in terms of operational efficiency; bringing these skills to bear on the organization's behalf is expected to result in reduced costs and an improved customer experience.
- Whereas the impact on operational efficiencies is generally expected to be significant, the impact on revenues is expected to be more modest.
- There is some confusion about how effective the firms in the study have been in establishing data analytics capabilities. Respondents see their organizations as effective in building an analytics-enabled work force but did not believe that the organizations are adequately supplied with enough data science employees or an adequate technical infrastructure.
- Given the nature of responses, there appear to be two possibilities related to the responding organizations' strategy for acquiring data science talent: 1) Organizations have not yet developed a talent acquisition strategy for data science/analytics, or 2) the operational arm of talent acquisition is not aware of the strategy—that is, there is a disconnect between those who have developed such a strategy and those who would be tasked with implementing the strategy to recruit data analytics talent at the entry level.
- The key to recruiting for data analytics skills is seen as developing a competitive compensation strategy. Inadequate compensation is seen as the biggest deterrent to recruiting this talent, while competitive compensation is seen as the most effective strategy for successfully recruiting for data analysis skills.
- There is general agreement that data analytic skills will be necessary for all management levels in the near future.
- Among URR respondents, there is very little knowledge of cybersecurity hiring. At the same time, there is a general belief that hiring cybersecurity talent directly from college/universities would be effective and that a competitive compensation package would be the best strategy for attracting cybersecurity talent.

Responses from career services professionals suggest the following:

- Data analytics are viewed as important skills, and the vast majority of responding institutions already have courses in place to teach these skills, particularly at the undergraduate level.
- Data analytics coursework appears to be required of some majors in virtually all the major disciplines (arts and humanities, business, mathematics and the physical sciences, social sciences, and engineering), although less so in the arts/humanities and social sciences than in other disciplines.
- Respondents identified data analytics coursework to be most aligned with business, even more so than math, science, or engineering.
- Caveat: Although career services respondents were generally experienced (the majority have been at their institutions for more than 10 years), a significant proportion do not seem to be knowledgeable about the academic requirements for their graduates. Approximately one-third did not know whether data analytics courses were required of graduates, regardless of discipline.
- Among those able to provide a response, enrollments are the most used criterion for assessing the strength of the data analytics program; however, a large group of respondents have no knowledge of how academic programs are assessed.
- For those who could express an opinion, there is an indication that adequate funding for data science/analytics programs is not available and hampers the development of these programs at colleges and universities. However, only about one-half of the respondents felt able to judge the adequacy of funding for such programs.
- Most respondents expect the demand for data analytics skills to increase in the near future; at the same time, however, they do not think these skills will be universally required for graduates. In addition, respondents could not address the questions surrounding the appeal of these programs to women or minority populations.

- There is general agreement that industry input into the development of data analytics coursework would improve the skills students would graduate with in this area. However, one-half of respondents are not aware of the involvement of industry with these programs at the current time.
- A majority of respondents believe that it would be advantageous for their students to be taught cybersecurity skills; however, the sentiment on behalf of developing cybersecurity skills is not as strong as it is for developing data analytic skills.
- A bare majority (52 percent) of the schools responding to the survey currently offer cybersecurity courses to their undergraduates.
- There is a strong consensus that enrollments in cybersecurity courses will increase in the near future, but there is no consensus that colleges and universities are increasing the number of cybersecurity courses that will be available to their students.
- As with data analytics, respondents felt that industry input in the development of cybersecurity courses would be very helpful.

Detailed results of both surveys follow.

Results

University Relations and Recruiting Professionals: Data Tables

FIGURE 1

Where do you expect the use of data analytics to have the most positive impact on your company?

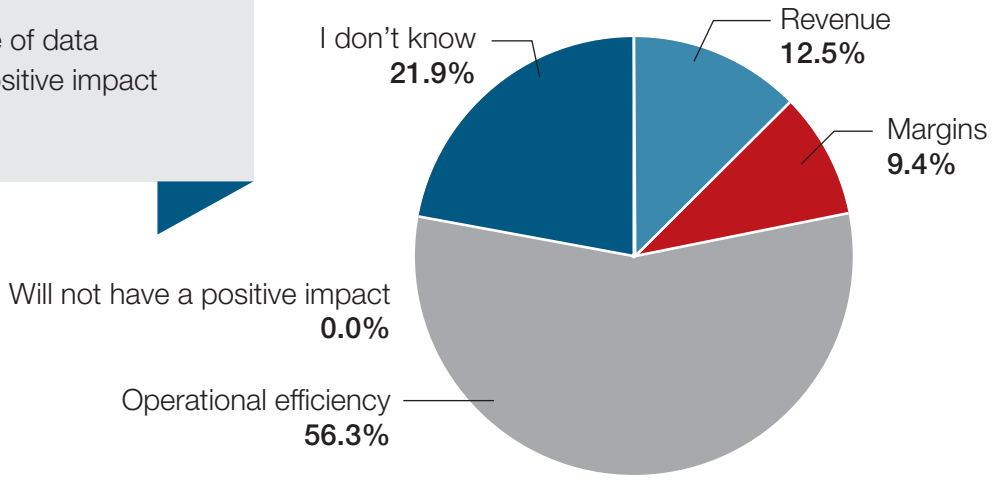

FIGURE 2

How do you expect your company's **revenue** to increase because of the use of data science and analytics?

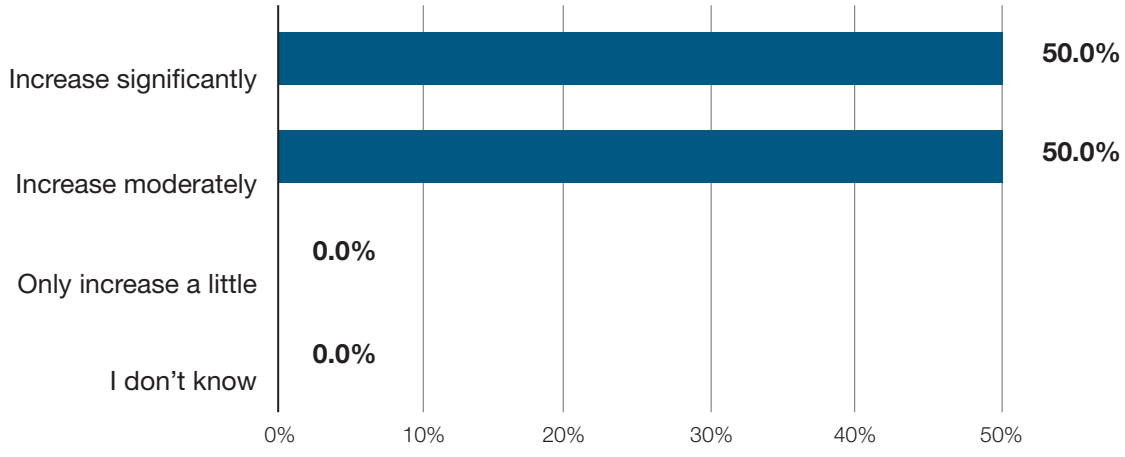

FIGURE 3

How do you expect your company's **margins** to improve because of the use of data science and analytics?

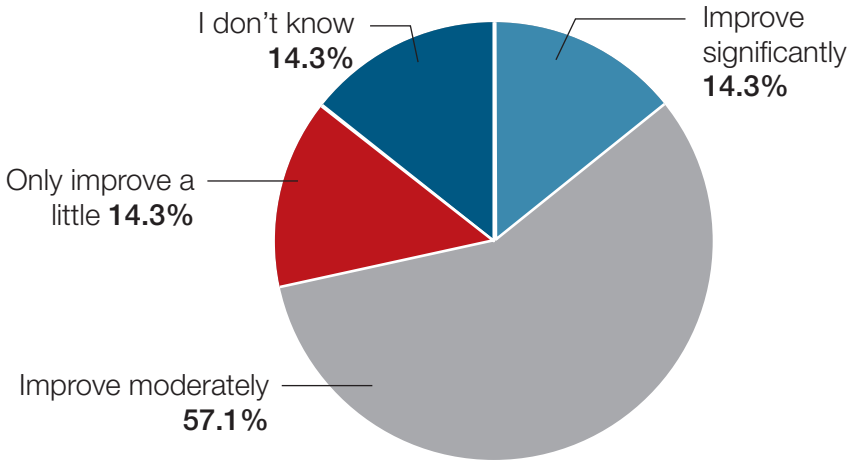

FIGURE 4

How do you expect your company's **operational efficiency** to improve because of the use of data science and analytics?

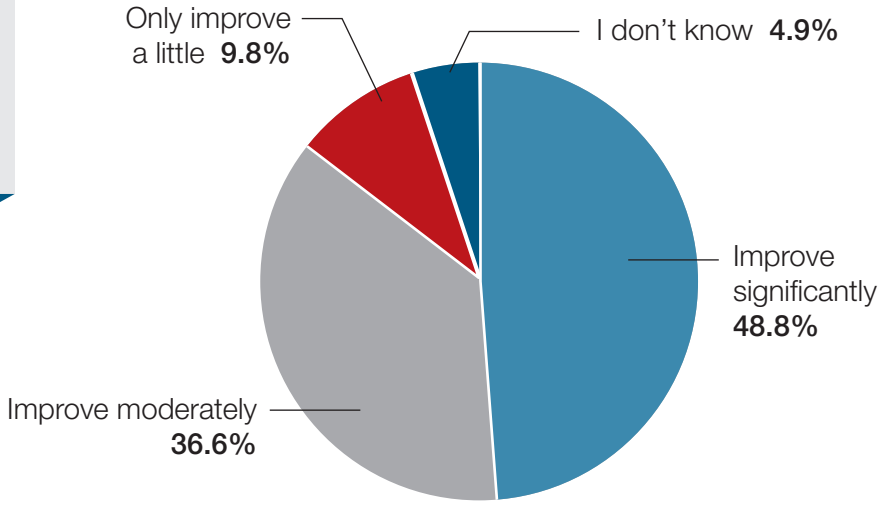

FIGURE 5

Top two business needs to be met by data analytics

FIGURE 6

Effectiveness in creating an analytics-enabled work force

How effective has your company been at creating an analytics-enabled work force?

	% of Respondents
Very effective	13.6%
Somewhat effective	72.7%
Not at all effective	0.0%
I don't know	13.6%
Total	**100.0%**

FIGURE 7

Conducted a skills planning analysis in past two years

In the past 24 months, has your organization conducted a skills planning analysis about the data science and analytics skills you will need in the future? This could be through an advisory group, formal assessment, or some other analysis.

	% of Respondents
Yes	22.7%
No	22.7%
I don't know	54.5%
Total	**100.0%**

FIGURE 8

Will conduct a skills planning analysis in the next two years

In the next 24 months, does your organization plan to conduct a skills planning analysis about the data science and analytics skills you will need in the future?

	% of Respondents
Yes	20.0%
No	40.0%
I don't know	40.0%
Total	**100.0%**

FIGURE 9

Data analytics skills/capabilities – Current status

	I don't know	1 *Strongly Disagree*	2	3	4	5 *Strongly Agree*
	% of Respondents					
My company currently has enough people with data science and analytics skills.	14.3%	9.5%	33.3%	28.6%	9.5%	4.8%
My company has the data and technology infrastructure we need to derive value from data.	14.3%	0.0%	38.1%	19.0%	23.8%	4.8%

FIGURE 10

Data analytics skills/capabilities in roles – Required in the next three years

	I don't know	Required of everyone	Required of some people	Not required for this job	N/A
	% of Respondents				
Executive leaders	23.8%	23.8%	38.1%	9.5%	4.8%
Finance and accounting managers	28.6%	14.3%	57.1%	0.0%	0.0%
Human resources managers	19.0%	4.8%	66.7%	9.5%	0.0%
Marketing and sales managers	33.3%	9.5%	57.1%	0.0%	0.0%
Operations managers (such as purchasing, production and quality, or information technology managers)	23.8%	28.6%	42.9%	4.8%	0.0%
Supply chain distribution and logistics managers	28.6%	23.8%	47.6%	0.0%	0.0%

FIGURE 11

Easier or more difficult to attract people with data analytic skills

Thinking about your company's overall experience, has it been easier, about the same, or more difficult to attract people with data science and analytics skills relative to people with general business skills?

	% of Respondents
Easier	14.3%
About the same	19.0%
More difficult	42.9%
I don't know	23.8%
Total	**100.0%**

FIGURE 12

Challenges faced in attracting data analytic skills

	I don't know	Yes	No
	% of Respondents		
My company does not know what data science and analytics skills it needs.	11.1%	22.2%	66.7%
There is a lack of career advancement opportunities for people in these roles in my company.	22.2%	0.0%	77.8%
My company does not offer competitive compensation for people in these roles.	0.0%	66.7%	33.3%
My company does not use advanced data science and analytics practices.	11.1%	11.1%	77.8%
My company has an outdated data and technology infrastructure.	11.1%	44.4%	44.4%

FIGURE 13

Most difficult people in data science to attract

Thinking about data science and analytics talent in your company, which of the following types of people are the most difficult to attract?

	% of Respondents
Analysts with strong data science and analytics skills	44.4%
Data scientists or engineers	22.2%
Executive leaders that manage or lead the agenda for data analytics	22.2%
I don't know	11.1%
Total	**100.0%**

FIGURE 14

Positives for attracting data analytic skills

	I don't know	Yes	No
	% of Respondents		
My company knows what data science and analytics skills it needs.	18.8%	68.8%	12.5%
There are career advancement opportunities for people in these roles in my company.	25.0%	75.0%	0.0%
My company offers competitive compensation for people in these roles.	31.3%	31.3%	37.5%
My company uses advanced data science and analytics practices.	18.8%	75.0%	6.3%
My company has an updated data and technology infrastructure.	18.8%	37.5%	43.8%

FIGURE 15

Effectiveness of strategies for attracting data analytic skills

	I don't know	Very effective	Somewhat effective	Not at all effective	N/A
	% of Respondents				
Training your employees through company-provided workshops, online courses, or by providing reimbursement for further education.	32.1%	7.5%	49.1%	0.0%	11.3%
Acquiring companies with data science capabilities.	32.1%	3.8%	15.1%	0.0%	49.1%
Using traditional external recruitment agencies or search firms.	22.6%	3.8%	41.5%	9.4%	22.6%
Offering competitive salaries and benefits packages.	15.1%	18.9%	52.8%	3.8%	9.4%
Hiring directly from colleges and universities.	15.1%	32.1%	34.0%	5.7%	13.2%
Hiring directly from government-sponsored programs such as the federal government's TechHire Initiative or other programs designed to build talent pipelines in communities across the country.	32.1%	3.8%	5.7%	1.9%	56.6%

FIGURE 16

Difficulty of attracting cybersecurity recruits

Thinking about your company's overall experience, has it been easier, about the same, or more difficult to attract people to fill cybersecurity roles relative to other positions in your company?

	% of Respondents
Easier	0.0%
About the same	26.3%
More difficult	26.3%
I don't know	47.4%
Total	**100.0%**

FIGURE 17

Level of agreement

	I don't know	1 *Strongly Disagree*	2	3	4	5 *Strongly Agree*
		% of Respondents				
Having a demographically-diverse work force is very important to our company.	10.0%	10.0%	0.0%	5.0%	25.0%	50.0%
My company can respond effectively to a significant cyberattack.	40.0%	0.0%	0.0%	0.0%	35.0%	25.0%

FIGURE 18

Challenges in attracting cybersecurity skills

	I don't know	Yes	No
	% of Respondents		
My company does not know what cybersecurity skills it needs.	16.7%	0.0%	83.3%
There is a lack of career advancement opportunities for people in cybersecurity in my company.	33.3%	0.0%	66.7%
My company does not offer competitive compensation for people in cybersecurity.	16.7%	33.3%	50.0%
My company does not employ cybersecurity practices.	16.7%	0.0%	83.3%
My company has an outdated cybersecurity infrastructure.	33.3%	0.0%	66.7%

FIGURE 19

Reasons for attracting cybersecurity skills

	I don't know	Yes	No
	% of Respondents		
My company knows what cybersecurity skills it needs.	9.1%	90.9%	0.0%
There are career advancement opportunities for people in cybersecurity in my company.	27.3%	54.5%	18.2%
My company offers competitive compensation for people in cybersecurity.	27.3%	54.5%	18.2%
My company uses advanced cybersecurity practices.	36.4%	63.6%	0.0%
My company has an updated cybersecurity infrastructure.	18.2%	72.7%	9.1%

FIGURE 20

Effectiveness of strategies for increasing cybersecurity skills

	I don't know	Very effective	Somewhat effective	Not at all effective	N/A
	% of Respondents				
Training my employees: This could be through company-provided workshops or online courses, or through reimbursement for further education.	40.4%	7.7%	38.5%	0.0%	13.5%
Acquiring companies with cybersecurity capabilities.	25.0%	7.7%	9.6%	1.9%	55.8%
Using traditional external recruitment agencies or search firms.	26.9%	7.7%	30.8%	5.8%	28.8%
Offering competitive salaries and benefits packages.	25.0%	19.2%	42.3%	1.9%	11.5%
Hiring directly from colleges and universities.	17.3%	21.2%	34.6%	3.8%	23.1%
Hiring directly from government-sponsored programs such as the federal government's TechHire Initiative or other programs designed to build talent pipelines in communities across the country.	34.6%	3.8%	5.8%	5.8%	50.0%

FIGURE 21

Projections for data analytic skills

	I don't know	1 *Strongly Disagree*	2	3	4	5 *Strongly Agree*
	% of Respondents					
In five years, my company will always prefer job candidates with data science and analytics skills over ones without data science and analytics skills.	9.6%	3.8%	1.9%	23.1%	44.2%	17.3%
In five years, data science and analytics skills will be as essential as communication skills in my company.	15.4%	1.9%	5.8%	28.8%	34.6%	13.5%
In five years, data scientists will drive new innovation in my company.	13.5%	1.9%	5.8%	21.2%	32.7%	25.0%

FIGURE 22

Conditions that might help increase the availability of data analytic skills

	I don't know	1 *Not at all helpful*	2	3	4	5 *Extremely helpful*
	% of Respondents					
A skills framework for data science and analytics that business and higher education can use.	25.0%	0.0%	0.0%	10.4%	41.7%	22.9%
Data science training for my company's leaders provided by higher education institutions.	27.1%	4.2%	4.2%	25.0%	29.2%	10.4%
Increase in the number of institutions offering undergraduate degrees that focus on data science and analytics.	16.7%	0.0%	6.3%	14.6%	37.5%	25.0%
Increase in the number of institutions offering advanced degrees, such as master's or doctoral programs that focus on data science and analytics.	14.9%	8.5%	6.4%	14.9%	34.0%	21.3%

FIGURE 23

Conditions that might help increase the availability of cybersecurity skills

	I don't know	1 *Not at all helpful*	2	4	5 *Extremely helpful*
	% of Respondents				
Training provided by external consultants or organizations to teach employees basic cybersecurity practices.	56.3%	2.1%	6.3%	20.8%	14.6%
Increase in the number of formal programs that teach people how to predict security threats.	41.7%	0.0%	6.3%	27.1%	25.0%
More opportunities to learn from other organizations about cybersecurity threats.	44.7%	2.1%	4.3%	25.5%	23.4%
Consensus between the public and private sector on cybersecurity and online privacy standards.	58.3%	0.0%	2.1%	20.8%	18.8%

Results

Career Services Professionals: Data Tables

FIGURE 24

How important is it to your institution that undergraduate students are taught data science and analytics skills?

Answer Options	Response Percent
1 – Not at all important	2.3%
2	4.5%
3	15.8%
4	30.8%
5 – Extremely important	37.1%
I don't know	9.5%

FIGURE 25

Does your institution currently offer any **undergraduate** data science and analytics courses such as business analytics, biomedical information, or data mining and statistical learning?

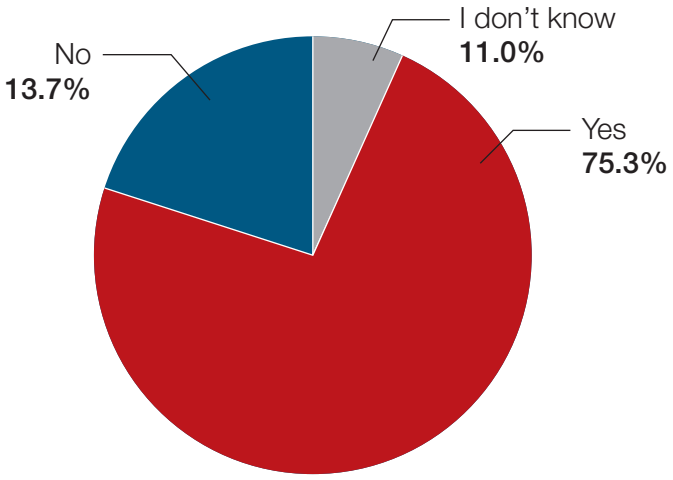

FIGURE 26

Does your institution currently offer any **advanced degree** data science and analytics courses such as business analytics, biomedical information, or data mining and statistical learning?

Answer Options	Response Percent
Yes – both master's and doctoral programs	19.1%
Yes – master's only	32.7%
Yes – doctoral only	0.0%
No	40.9%
I don't know	7.3%

FIGURE 27

Are undergraduate data science and analytics programs at your institution coordinated by a single department or by multiple departments?

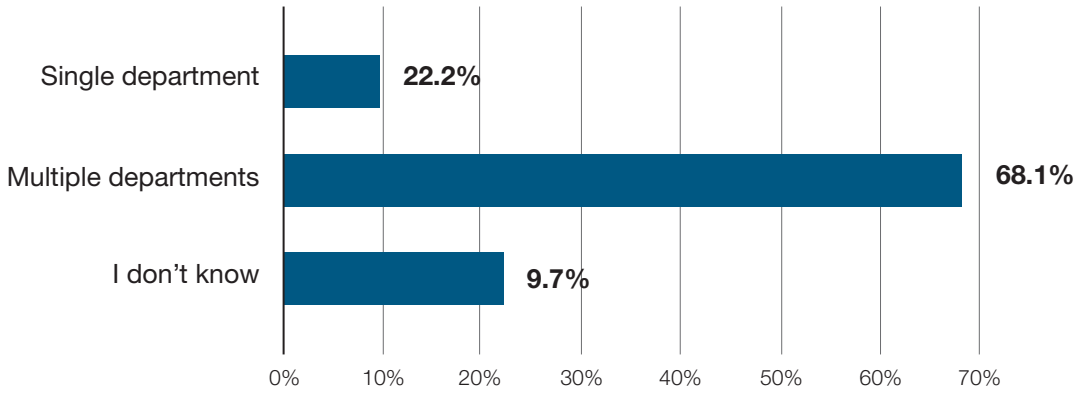

FIGURE 28

From where is your institution primarily receiving funding for undergraduate data science and analytics programs offered to students at your institution?

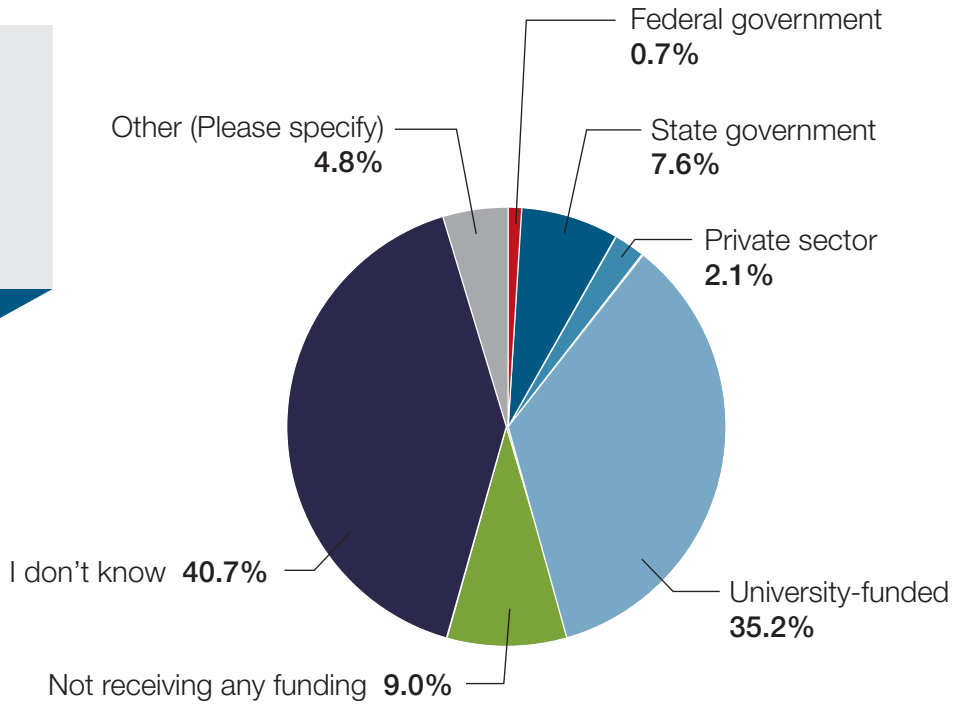

FIGURE 29

In the next three years, do you expect the number of students who enroll in undergraduate data science and analytics courses at this institution to change?

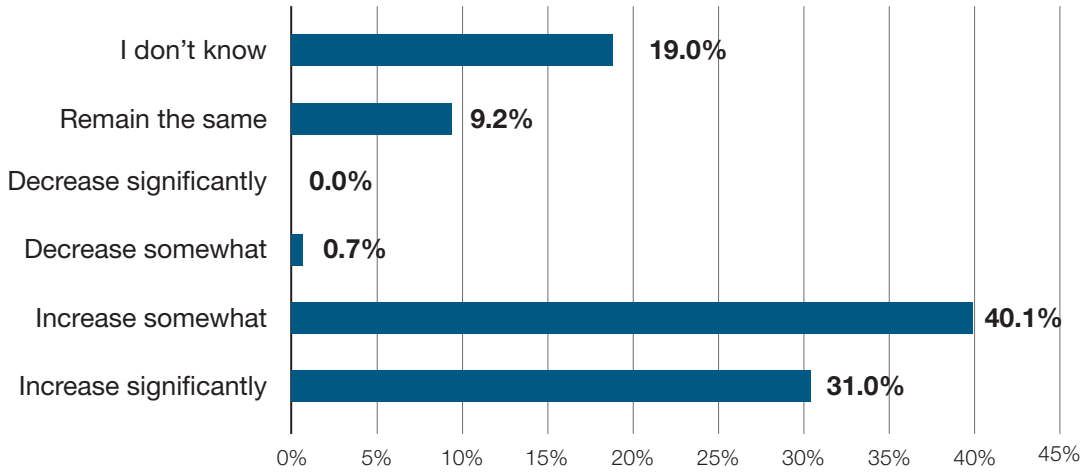

FIGURE 30

Are undergraduate data science and data analytics courses required?

Answer Options	Required for all majors	Required for some majors	Not required for any majors	N/A	I don't know
Arts and Humanities	7.1%	14.9%	36.9%	4.3%	36.9%
Business	24.3%	44.4%	11.1%	3.5%	16.7%
Math and Sciences	29.8%	31.2%	11.3%	5.7%	22.0%
Social Sciences	14.9%	24.8%	22.7%	5.7%	31.9%
Engineering	15.4%	26.6%	7.7%	27.3%	23.1%

FIGURE 31

Does your institution use any of the following ways to assess the strength of its undergraduate data science and analytics programs?

Answer Options	I don't know	Yes	No
Graduate job placement rates	39.3%	28.3%	32.4%
Enrollment rates	41.3%	18.2%	40.6%
Internship placements	31.3%	34.0%	34.7%
Grant funding	9.2%	31.9%	58.9%

FIGURE 32

In addition to the items we just discussed, does your institution use any other ways to assess the strength of its undergraduate data science and analytics programs?

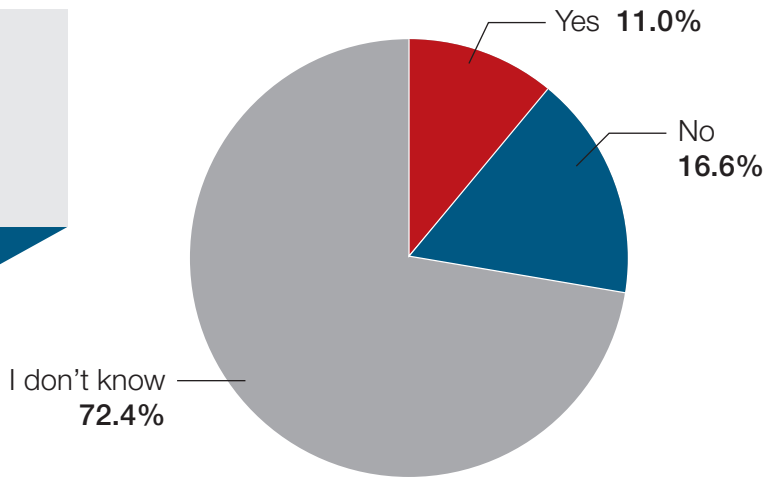

FIGURE 33

What are the main challenges your instituion faces in providing undergraduate data science and analytics courses? *(Please select only three responses.)*

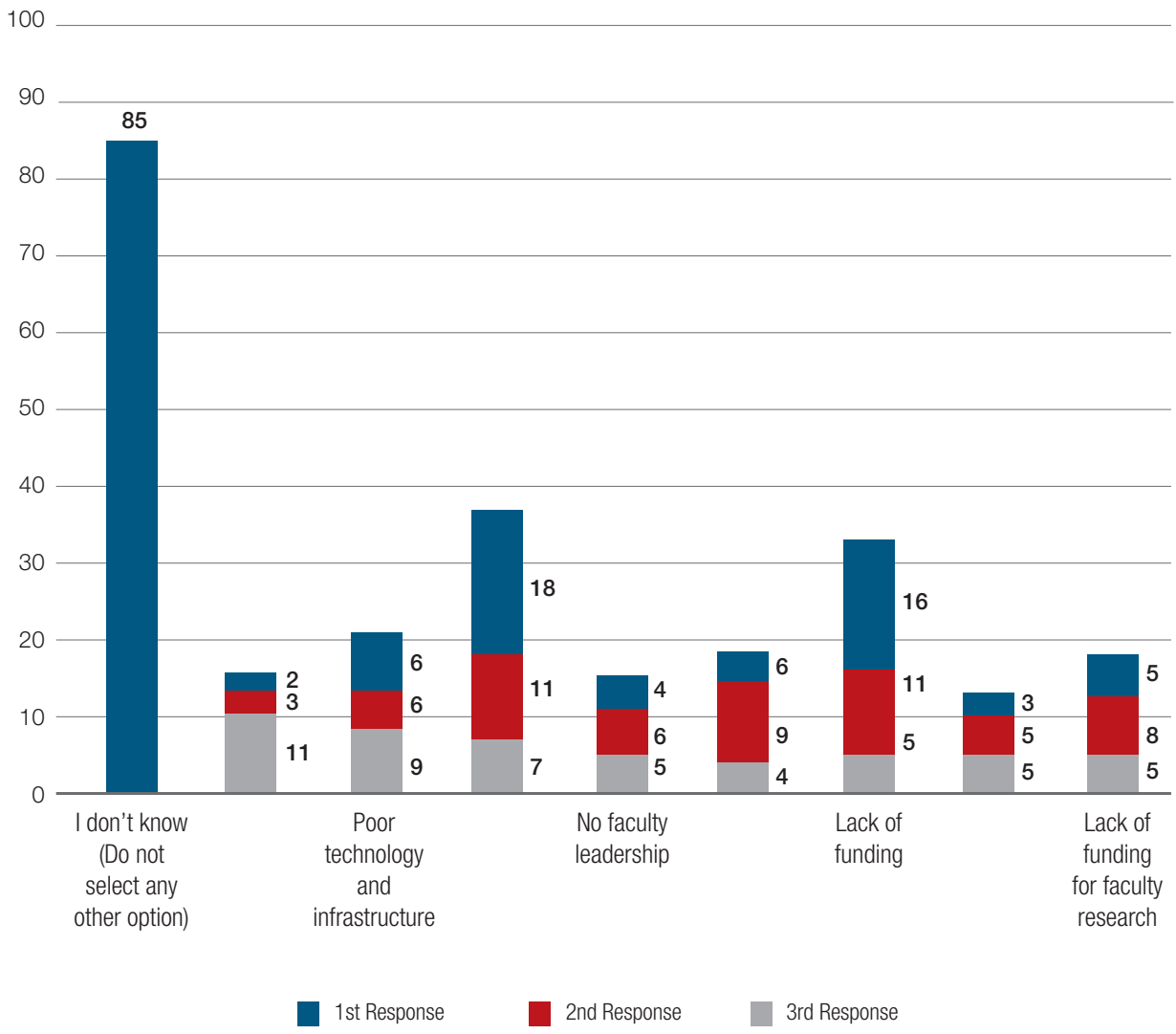

FIGURE 34

There are many factors that can impact higher education institutions' abilities to provide data science and analytics courses to undergraduate students. Please rate if the following are excellent, good, only fair, or poor at your institution.

Answer Options	Excellent	Good	Only fair	Poor	I don't know
Administrator support for data science	20.0%	34.7%	13.3%	3.3%	28.7%
Technology and infrastructure	16.8%	33.6%	18.1%	10.1%	21.5%
Faculty expertise in data science	18.1%	27.5%	20.1%	6.7%	27.5%
Faculty leadership in developing data science and analytics courses	18.9%	27.7%	13.5%	10.1%	29.7%
Current funding for data science and analytics-related programs or courses	3.4%	13.4%	23.5%	17.4%	42.3%
Existing funding opportunities for faculty research related to data science and analytics, such as research grants	4.0%	11.4%	23.5%	12.8%	48.3%

FIGURE 35

Please indicate your level of agreement with the following items.

Answer Options	1 *Strongly Disagree*	2	3	4	5 *Strongly Agree*	I don't know
Your institution has the funding it needs to develop undergraduate data science and analytics programs.	15.7%	19.6%	10.5%	9.8%	9.2%	35.3%
Your institution has funding options available if it wants to expand undergraduate data science and analytics programs.	13.2%	15.9%	13.2%	10.6%	4.0%	43.0%
Bachelor's degree graduates need to have data science and analytics skills to be competitive in the job market.	2.6%	5.9%	9.8%	28.1%	39.9%	13.7%
Undergraduate data science and analytics courses attract more women than other science and engineering courses.	2.0%	11.9%	6.6%	7.3%	2.6%	69.5%
Undergraduate data science and analytics courses attract more underrepresented minority students, such as Hispanics and African Americans, than traditional science and engineering courses.	4.0%	12.7%	8.7%	6.0%	1.3%	67.3%
In five years, all undergraduate students at this institution will graduate with data science and analytics skills.	18.8%	18.1%	12.8%	8.1%	4.7%	37.6%
Your institution is accelerating the development of undergraduate data science and analytics courses or programs because of industry interest.	16.8%	11.4%	13.4%	15.4%	13.4%	29.5%

FIGURE 36

How helpful would each of the following be in helping universities prepare undergraduate students with the data science and analytics skills that they will need in their jobs?

Answer Options	1 *Not at all helpful*	2	3	4	5 *Extremely helpful*	I don't know
A skills framework for data science and analytics that business and higher education can use	1.3%	0.7%	7.2%	30.9%	50.0%	9.9%
Development of industry recognized credentials, certifications or exams	2.6%	4.6%	16.6%	29.1%	37.1%	9.9%
Industry-validated course content for students and faculty	2.0%	2.0%	14.6%	23.8%	46.4%	11.3%

FIGURE 37

Does your institution currently consult with industry experts or businesses about undergraduate data science and analytics courses?

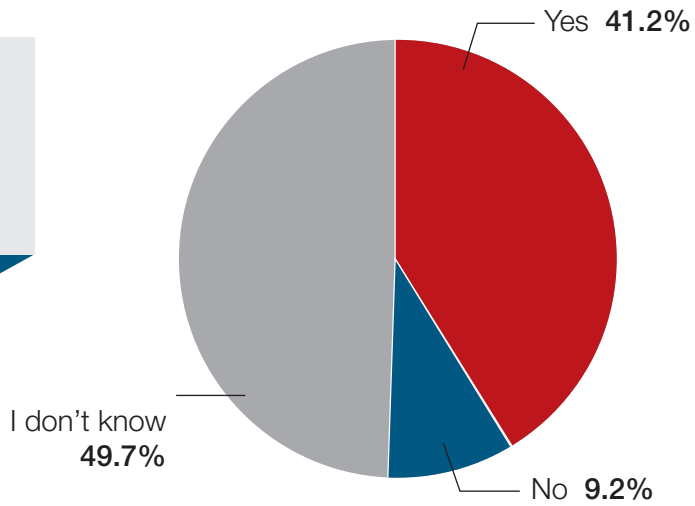

FIGURE 38

How helpful has the advice been that industry experts or businesses have provided to your institution about data science and analytics?

Answer Options	Response Percent
1 – Not at all helpful	0.0%
2	1.7%
3	10.0%
4	33.3%
5 – Extremely helpful	38.3%
I don't know	16.7%

FIGURE 39

How important is it to your institution that undergraduate students are taught cybersecurity skills?

Answer Options	Response Percent
1 – Not at all important	3.9%
2	10.5%
3	24.3%
4	25.0%
5 – Extremely important	17.1%
I don't know	19.1%

FIGURE 40

Does your institution currently offer any **undergraduate** cybersecurity courses?

Answer Options	Response Percent
Yes	51.6%
No	27.5%
I don't know	20.9%

FIGURE 41

Does your institution currently offer any **advanced degree** cybersecurity courses?

Answer Options	Response Percent
Yes	51.6%
No	27.5%
I don't know	20.9%

FIGURE 42

Are undergraduate cybersecurity programs at your institution coordinated by a single department or by multiple departments?

Answer Options	Response Percent
Single department	65.4%
Multiple departments	28.2%
I don't know	6.4%

FIGURE 43

From where is your institution primarily receiving funding for undergraduate cybersecurity programs offered to students at your institution?

Answer Options	Response Percent
The federal government	3.8%
The state government	12.8%
The private sector	0.0%
University-funded	33.3%
Not receiving any funding	11.5%
I don't know	32.1%
Other (please specify)	6.4%

FIGURE 44

In the next three years, do you expect the number of students who enroll in undergraduate cybersecurity courses at this institution to change?

Answer Options	Response Percent
Increase significantly	24.7%
Increase somewhat	54.5%
Decrease somewhat	0.0%
Decrease significantly	1.3%
Remain the same	7.8%
I don't know	11.7%

FIGURE 45

Does your institution use any of the following ways to assess the strength of its undergraduate cybersecurity programs?

Answer Options	Yes	No	I don't know
Graduate job placement rates	50.6%	23.4%	26.0%
Enrollment rates	57.7%	11.5%	30.8%
Internship placements	51.9%	23.4%	24.7%
Grant funding	22.7%	25.3%	52.0%

FIGURE 46

In addition to the items we just discussed, does your institution use any other ways to assess the strength of its undergraduate cybersecurity programs?

Answer Options	Response Percent
Yes	14.1%
No	12.8%
I don't know	73.1%

"Other" responses included:

- Employers on campus
- Feedback from employers and industry agencies that support research
- Center of Academic Excellence in Cyber Defense Education and mapping to the DICE framework
- Participating in cybersecurity competitions
- End of program assessment and benchmarking
- Academic program reviews that include assessing program learning objectives and institutional learning objectives
- SLO course assessment—the same assessment that is used across the curriculum in all majors
- Student learning outcomes assessment
- Employer feedback, student satisfaction; [in addition] we are a Center of Academic Excellence for Cyber Security resulting in outside agencies reviewing our programs.

FIGURE 47

Please indicate your level of agreement with the following item: Your institution is accelerating the development of undergraduate cybersecurity courses or programs because of industry interest.

Answer Options	Response Percent
1 – Strongly disagree	14.1%
2	10.7%
3	12.1%
4	8.1%
5 – Strongly agree	16.8%
I don't know	38.3%

FIGURE 48

How helpful would each of the following be in helping universities prepare undergraduate students with the cybersecurity skills that they will need in their jobs?

Answer Options	1 *Not at all helpful*	2	3	4	5 *Extremely helpful*	I don't know
A skills framework for cybersecurity that business and higher education can use.	0.7%	0.0%	6.8%	31.1%	48.0%	13.5%
Consensus between the private and public sector on cybersecurity and online privacy standards.	0.7%	2.0%	9.5%	28.4%	41.2%	18.2%
More opportunities to learn from other organizations about cybersecurity threats.	0.7%	0.7%	10.1%	30.2%	43.0%	15.4%

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