Microsoft High-Performance Computing Oil and Gas Industry Survey

February 2007

Gulf Research

Microsoft®

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- Respondent Demographics

About the Study

Study Methods

- A web-based survey was administered using the Gulf Research Oil and Gas Industry panel
- Emails inviting Gulf Research panel members to participate in the survey were distributed February 13th through 14th, 2007
- 104 screened, qualified responses were used for this report; respondents included in the sample met the following criteria:
  - Work for an oilfield service company, supply company, drilling contractor, oil and gas company, consulting firm, academia, engineering or construction firm
  - Must be a user, application manager, developer, technical support, evaluator, recommender or authorizer of purchase decisions for hardware and software for technical computing

How to Interpret the Results

- Margins of error at 95% confidence level for the entire sample is ± 10 percentage points
  - This means that, in repeated samples of equal size, the true population measure will fall within these margins of error in 95 of 100 samples

Question Areas

- Current usage
- Access to High Performance Computing capability
- Satisfaction
- Demographics

Summary and Conclusions

Microsoft dominates high-performance computing in the oilfield; plenty of power available, time not an issue, most are satisfied

HPC Operating Systems

- Microsoft OS dominates HPC environment in the upstream oil and gas industry
  - Microsoft applications used most often for data manipulation and reporting
  - ½ use internally or externally developed applications unique to company

Availability/Access to high performance computing power

- Users satisfied with current level of access to compute power
  - Most have ready access to sufficient compute power on their desktop
  - Today's compute power and iteration capabilities satisfy most needs
  - For data integration, most utilize systems within the company

Time required to do work using current technology

- About half spend 35% or less of their time on high-performance technical computing functions
- About half spend 20% or less of their time manipulating data and preparing final reports

Satisfaction with HPC applications

- Customized or internally developed software users more satisfied than users of third party software
  - Highest satisfaction with volume interpretation, geological modeling, mapping & volumetrics, and drilling well planning
  - Lowest satisfaction with current applications used for uncertainty management, rock physics, and data integration

Microsoft Windows dominates high-performance computing environments in the upstream oil and gas industry

Which operating system(s) do you utilize in your high-performance computing environment?

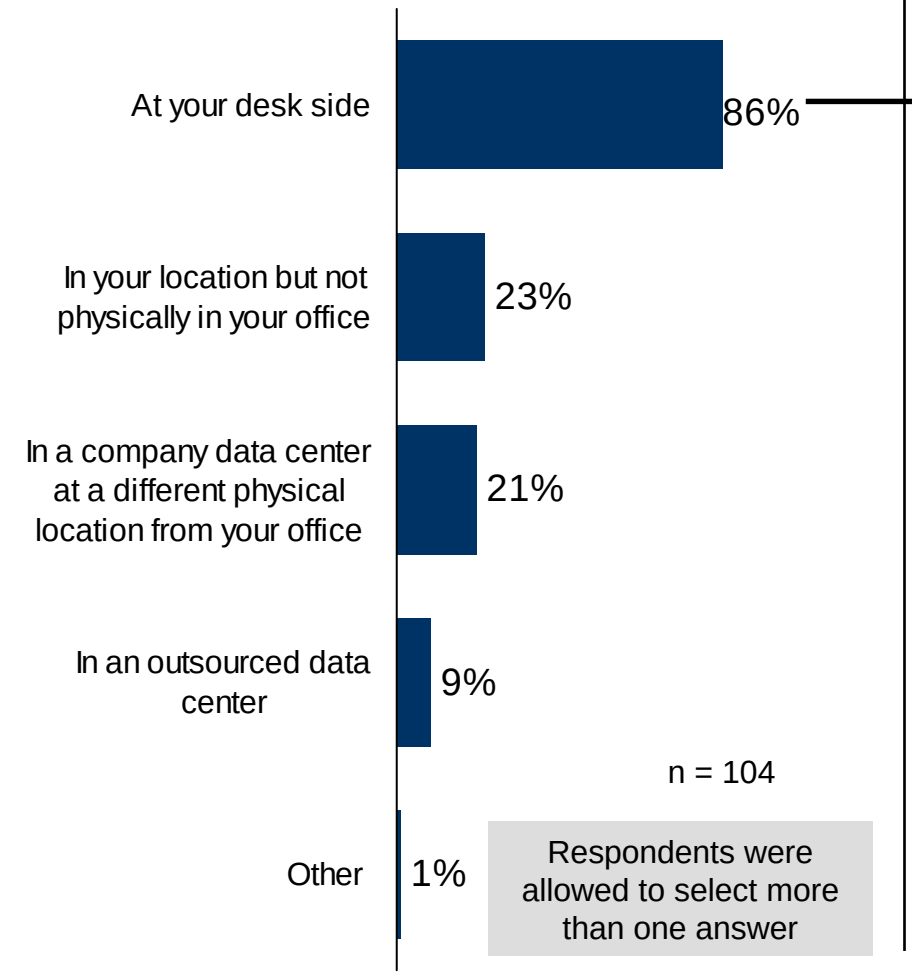
Operating system	Use on a daily basis	Rarely Use	Never Use
Windows	96%	2%	2%
Unix	12%	19%	69%
Linux	9%	18%	73%
Apple OS	4%	12%	85%
Other	1%	1%	-

n = 104

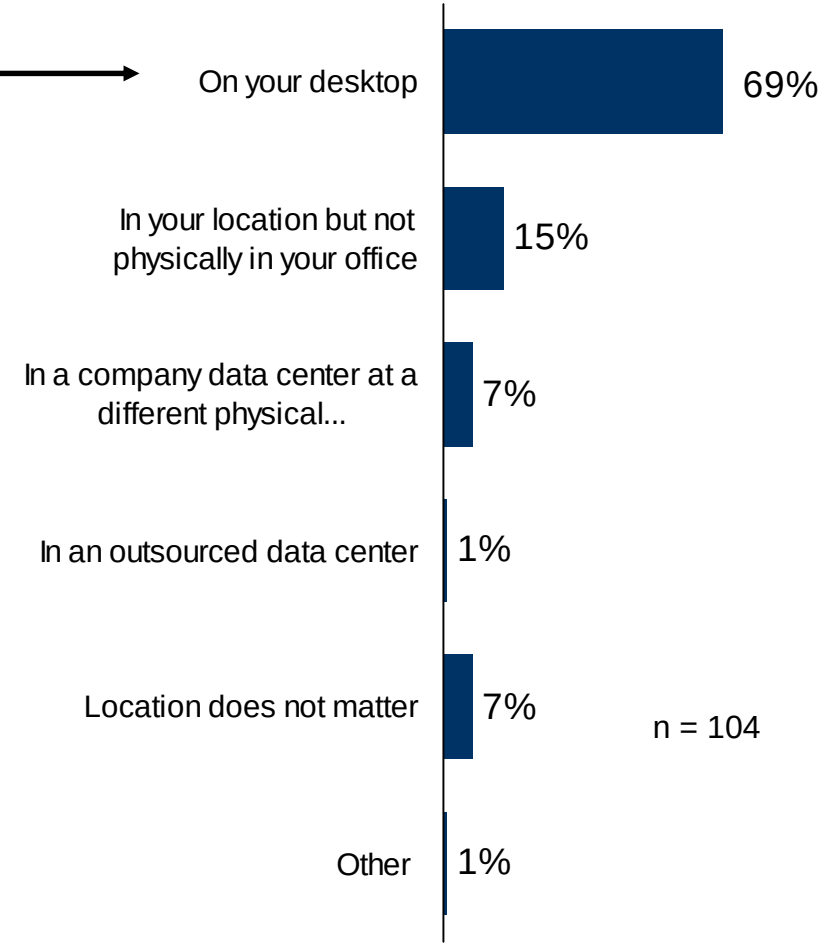
80 - 100 | 60 - 79 | 0 - 59

Most have and prefer compute power at their desktop

The compute power that you need to do your job is:



In terms of accessing the compute power you need to do your job, please select your most preferred location:



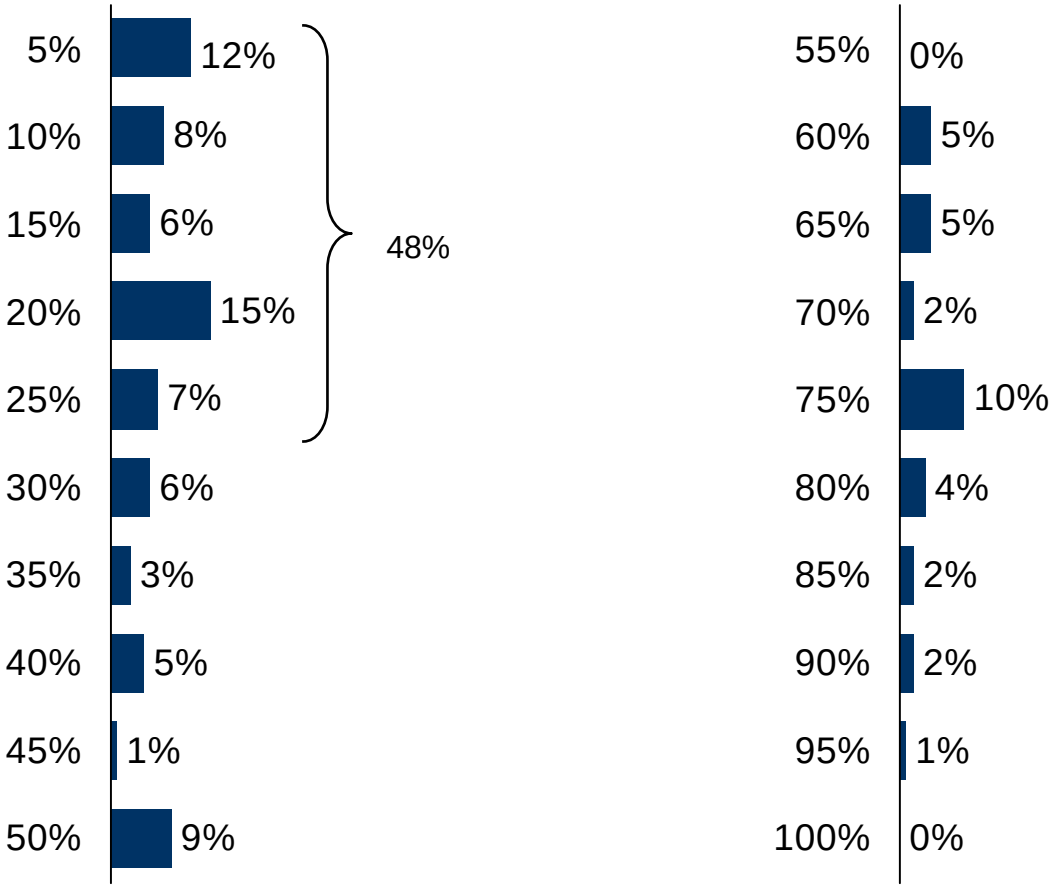
Q9 & Q10

Microsoft

Gulf Research

Half spend 25% or less of their time conducting high performance technical computing functions

In a work week of 40 hours, what percentage of your time do you spend on high performance technical computing functions?

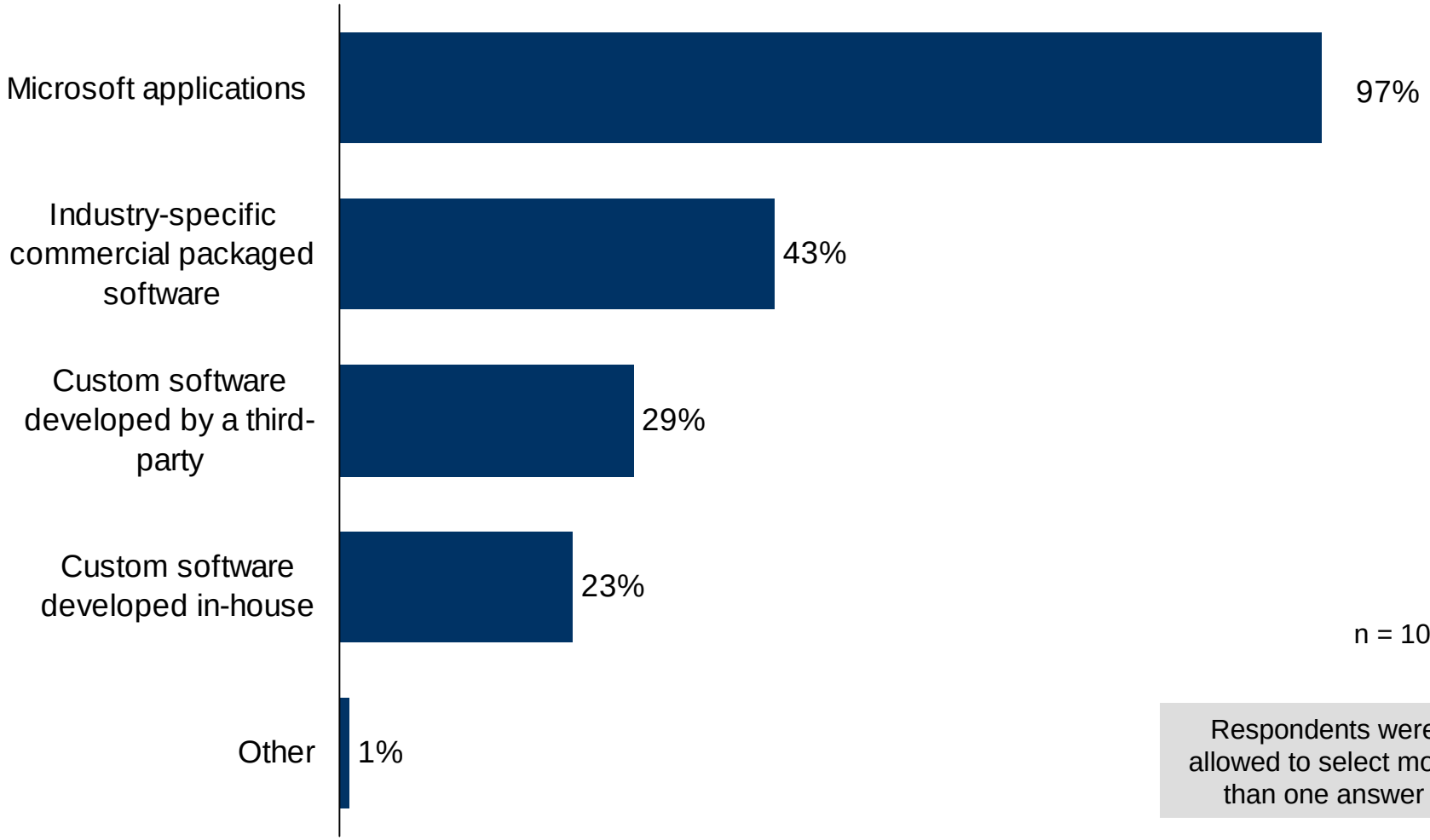


n = 103

Respondents selected a percentage in increments of 5, between 0% and 100%

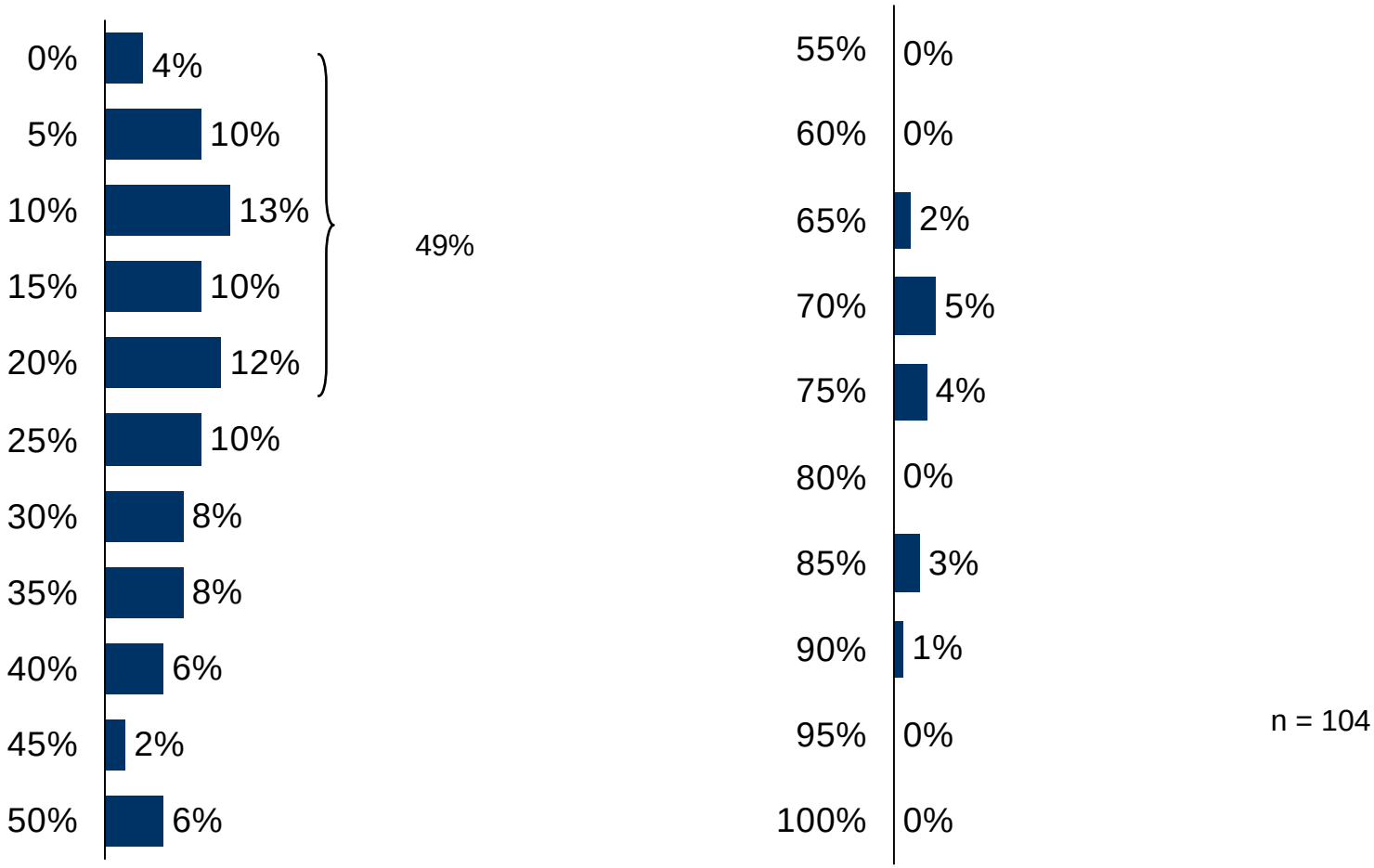
Most are utilizing Microsoft applications for data manipulation and reporting

In which of the following software applications do you manipulate and report technical data?
(Select all that apply)



Half spend 20% or less of their time manipulating data and preparing for final conclusions

What percentage of your time is spent manipulating and reporting technical data AFTER it is collected to make and present your final conclusions?



Respondents selected a percentage in increments of 5, between 0% and 100%

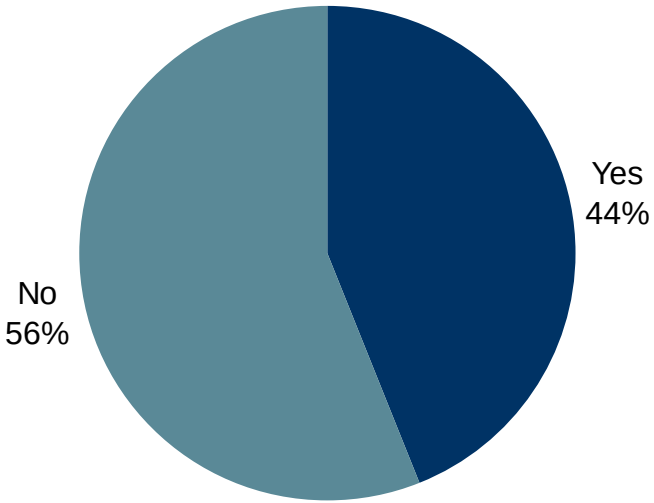
Q25

Microsoft

Gulf Research

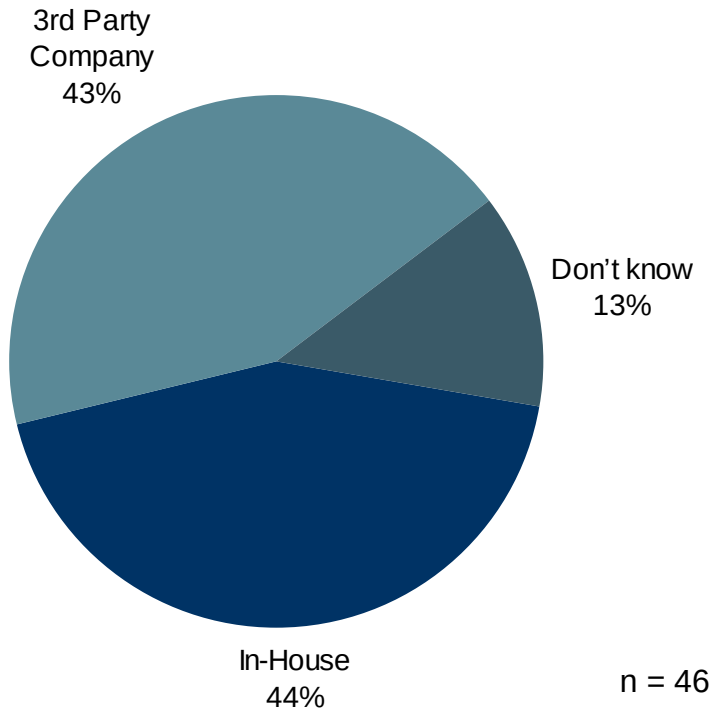
About half use computing applications that were developed in-house or by a 3rd party company

Do you have technical or scientific computing applications that are unique to your company or department?



n = 104

How were the technical or scientific computing applications that are unique to your company or department developed?

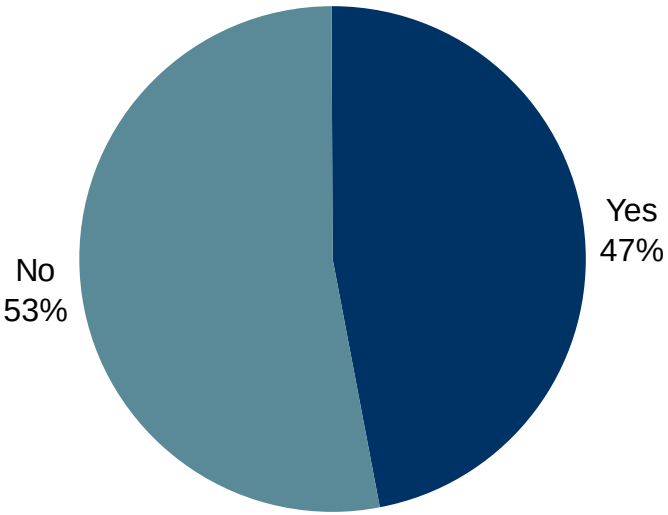


n = 46

Question only asked to respondents who have technical/scientific computing applications unique to their company

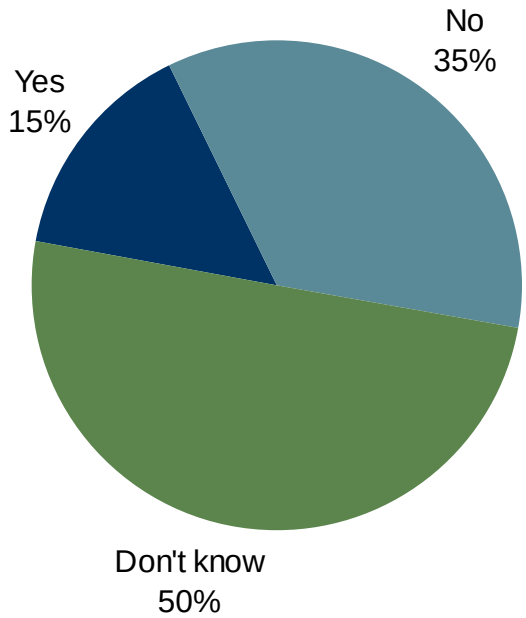
About half agree that their applications require multiple iterations; but few require parallel technology

Do your compute-intensive scientific applications require multiple iterations?



n = 100

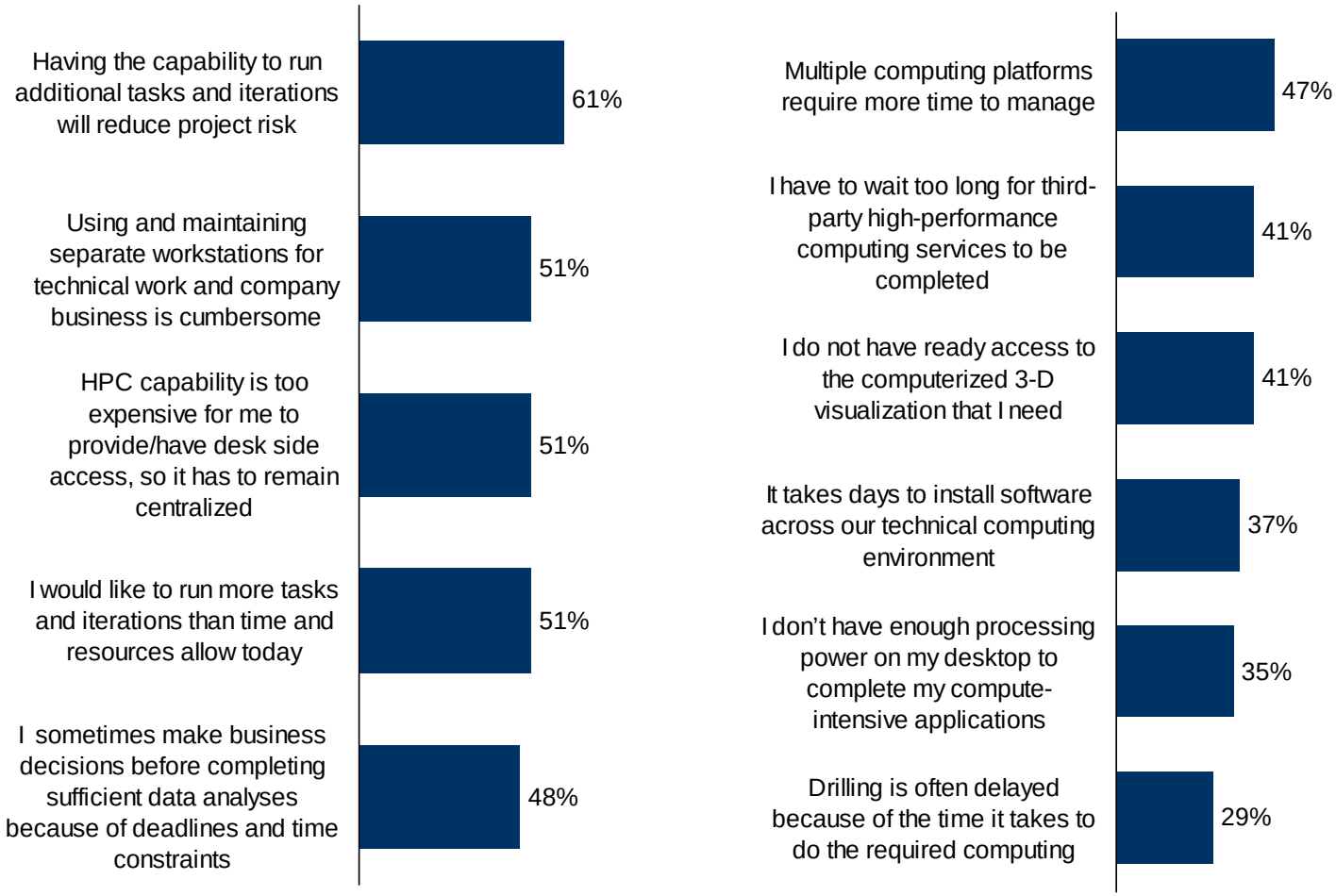
Do you use compute-intensive applications today that are not parallelized, yet you require parallel technology for your job?



n = 104

Users see benefits of increased capabilities, yet see few delays as a result of compute time

Using a scale of 1 to 5, where 1 indicates completely disagree and 5 indicates completely agree, please indicate your level of agreement with each of the following statements:

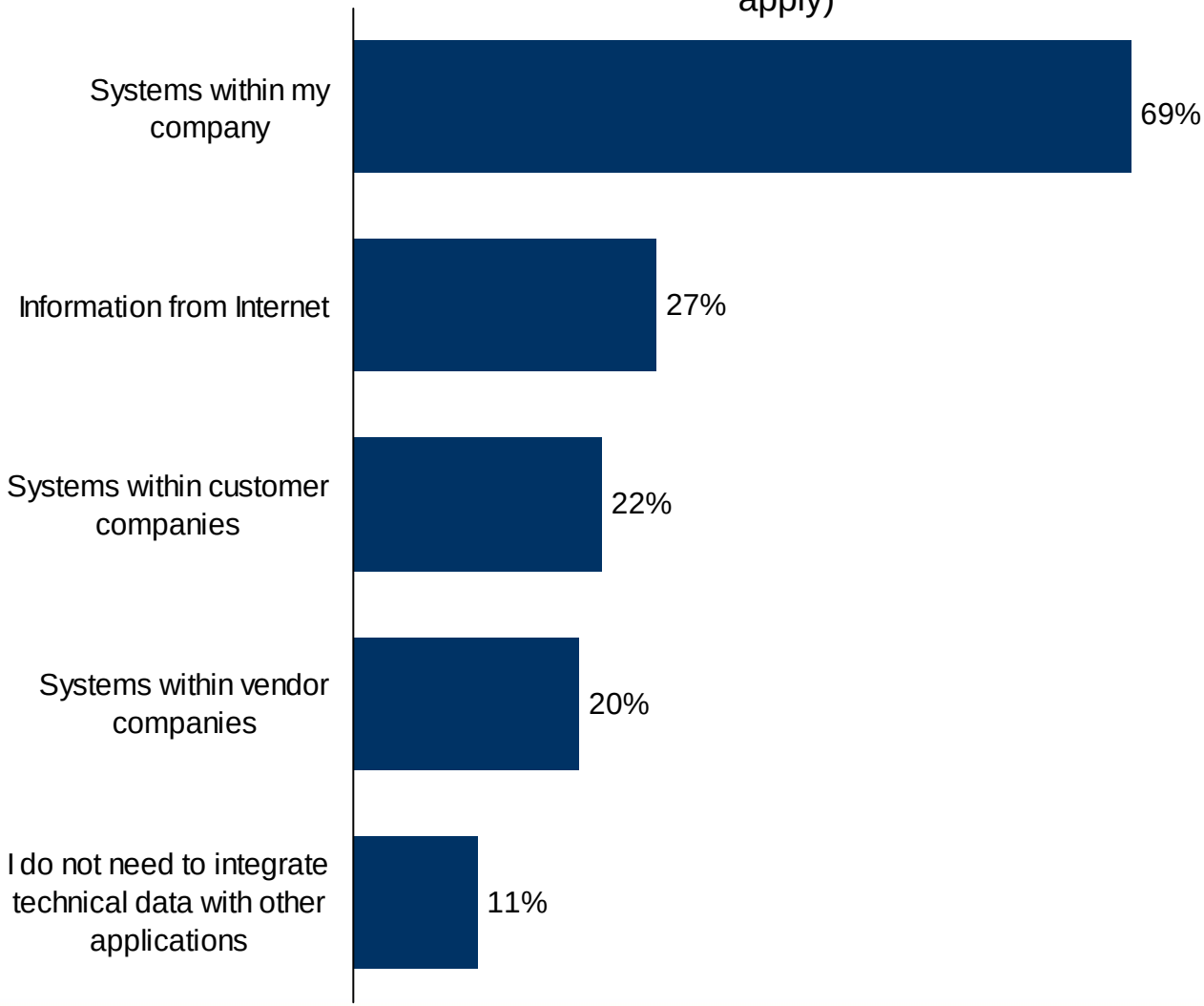


n = 68-86

Percentages represent those who selected a completely agree –5 or 4

Most integrate technical data integration on systems within the company

From which type of systems do you commonly need to integrate your technical data? (Select all that apply)

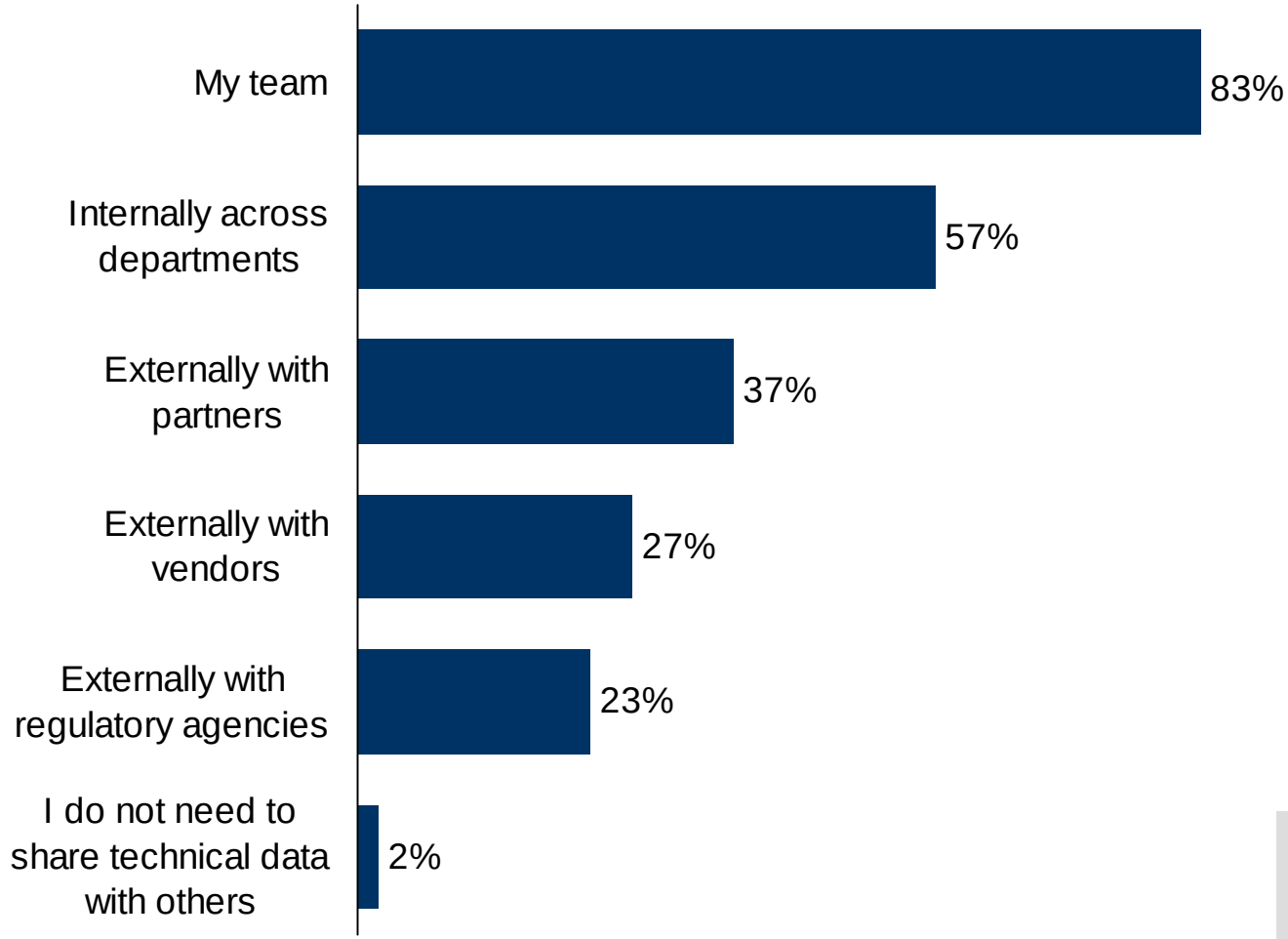


n = 104

Respondents were allowed to select more than one answer

Technical data is most commonly shared internally, but external sharing is not uncommon

Which of the following, if any, do you commonly need to share technical data with? (Select all that apply)

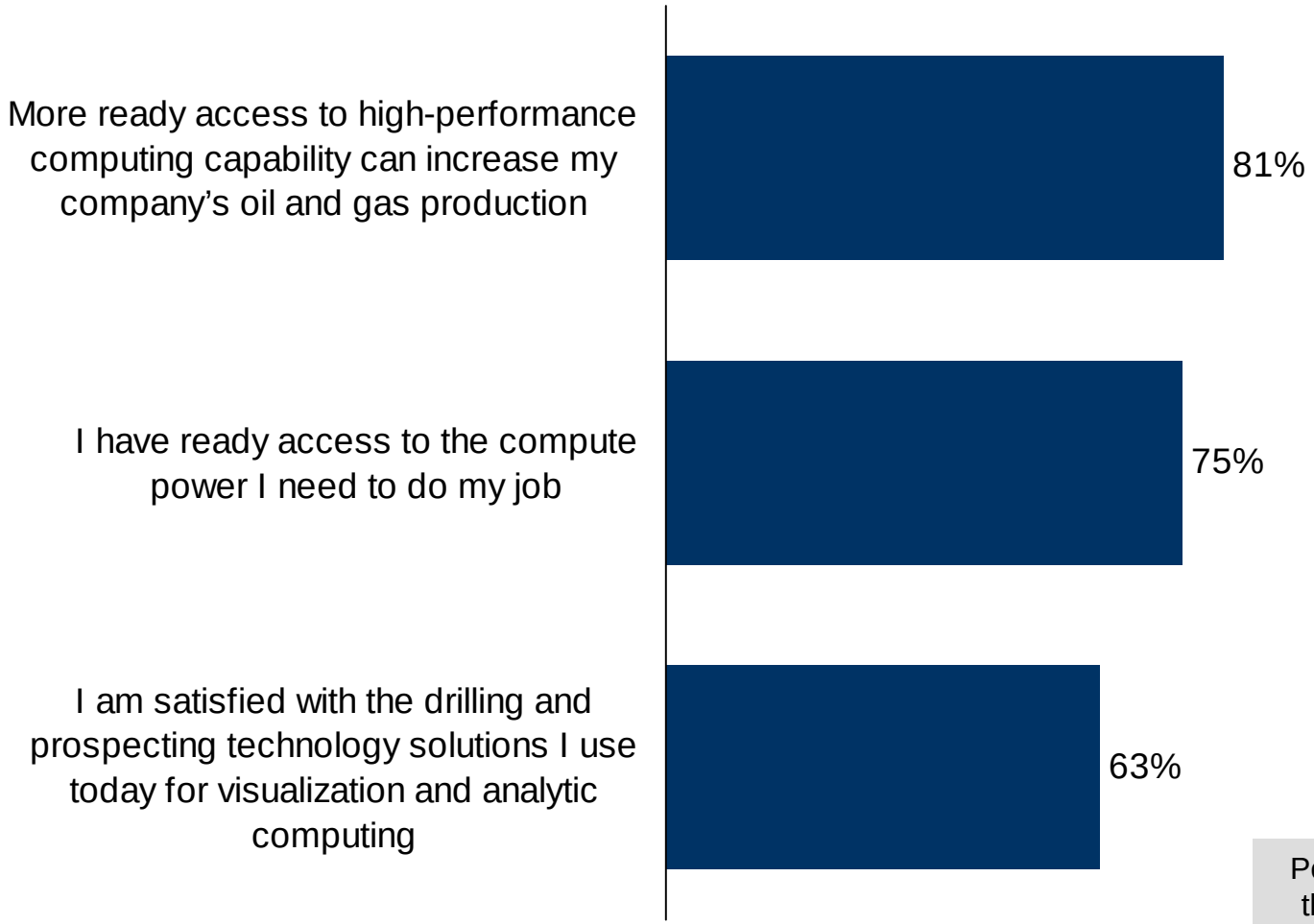


n = 104

Respondents were allowed to select more than one answer

More access may increase production, but most are satisfied with the current level of access and today's technology solutions

Please indicate your level of agreement with the following statements:

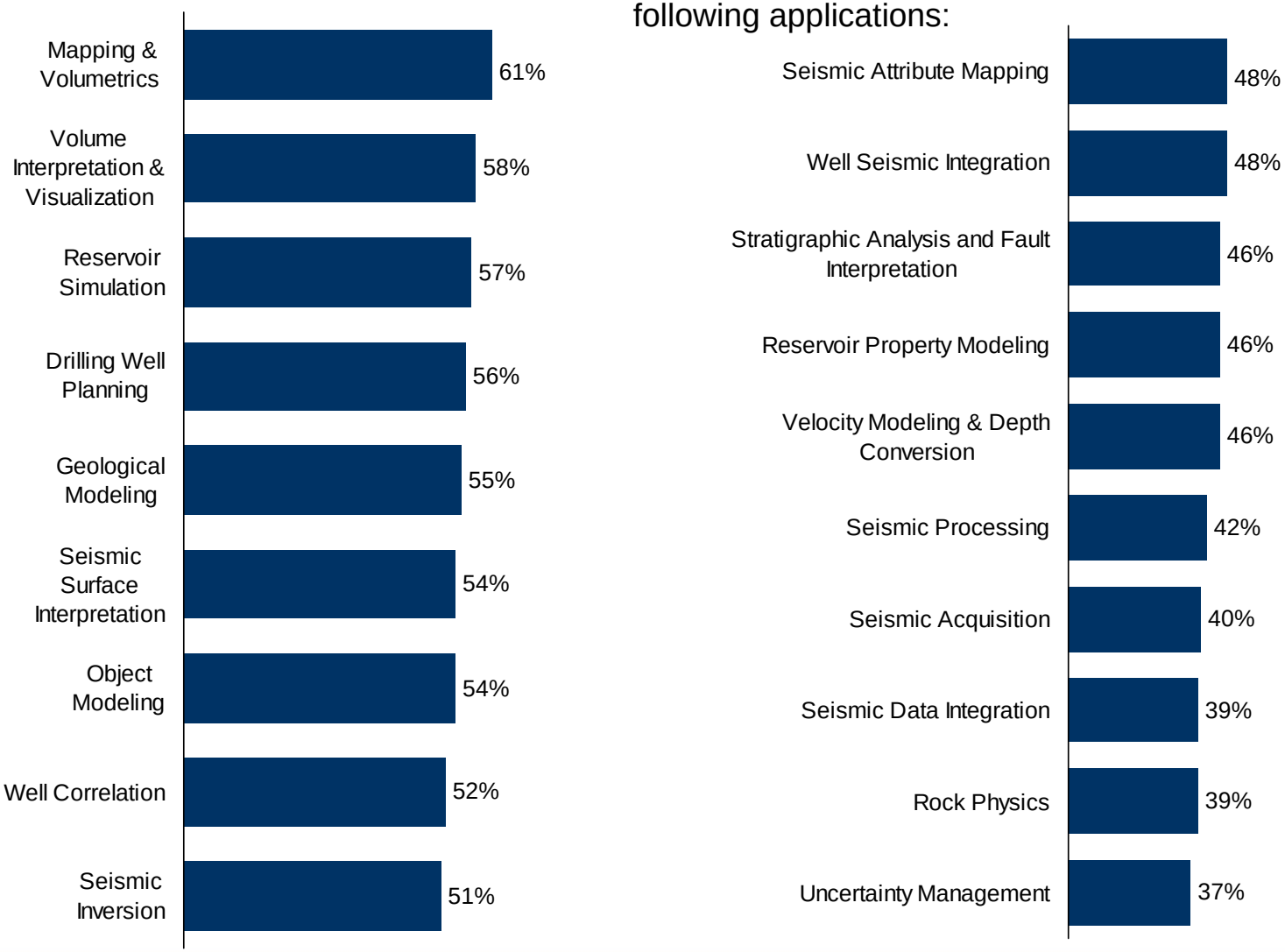


n = 104

Percentages represent those who selected a completely agree –5 or 4

Moderate satisfaction with compute power on most applications

How satisfied are you with the performance of your current technical computing capabilities for the following applications:



n = 35-64

Users of custom software tend to experience higher satisfaction with the performance of their computing capabilities

How satisfied are you with the performance of your current technical computing capabilities for the following applications:

Function	User of Custom Software	Do not use Custom Software	Total Sample
Mapping & Volumetrics	67%	51%	61%
Volume Interpretation & Visualization	67%	50%	58%
Reservoir Simulation	64%	50%	57%
Drilling Well Planning	56%	57%	56%
Geological Modeling	70%	38%	55%
Seismic Surface Interpretation	55%	53%	54%
Object Modeling	70%	38%	54%
Well Correlation	60%	45%	52%
Seismic Inversion	57%	44%	51%
Geological Interpretation	61%	39%	49%
Well Seismic Integration	57%	38%	48%
Seismic Attribute Mapping	60%	35%	48%
Stratigraphic Analysis and Fault Interpretation	53%	41%	46%
Reservoir Property Modeling	52%	39%	46%
Seismic Processing	44%	39%	42%
Seismic Acquisition	53%	25%	40%
Seismic Data Integration	40%	38%	39%
Rock Physics	33%	45%	39%
Uncertainty Management	43%	31%	37%
Velocity Modeling & Depth Conversion	53%	40%	36%

80 - 100

60 - 79

0 - 59

n = 16-64

Q11

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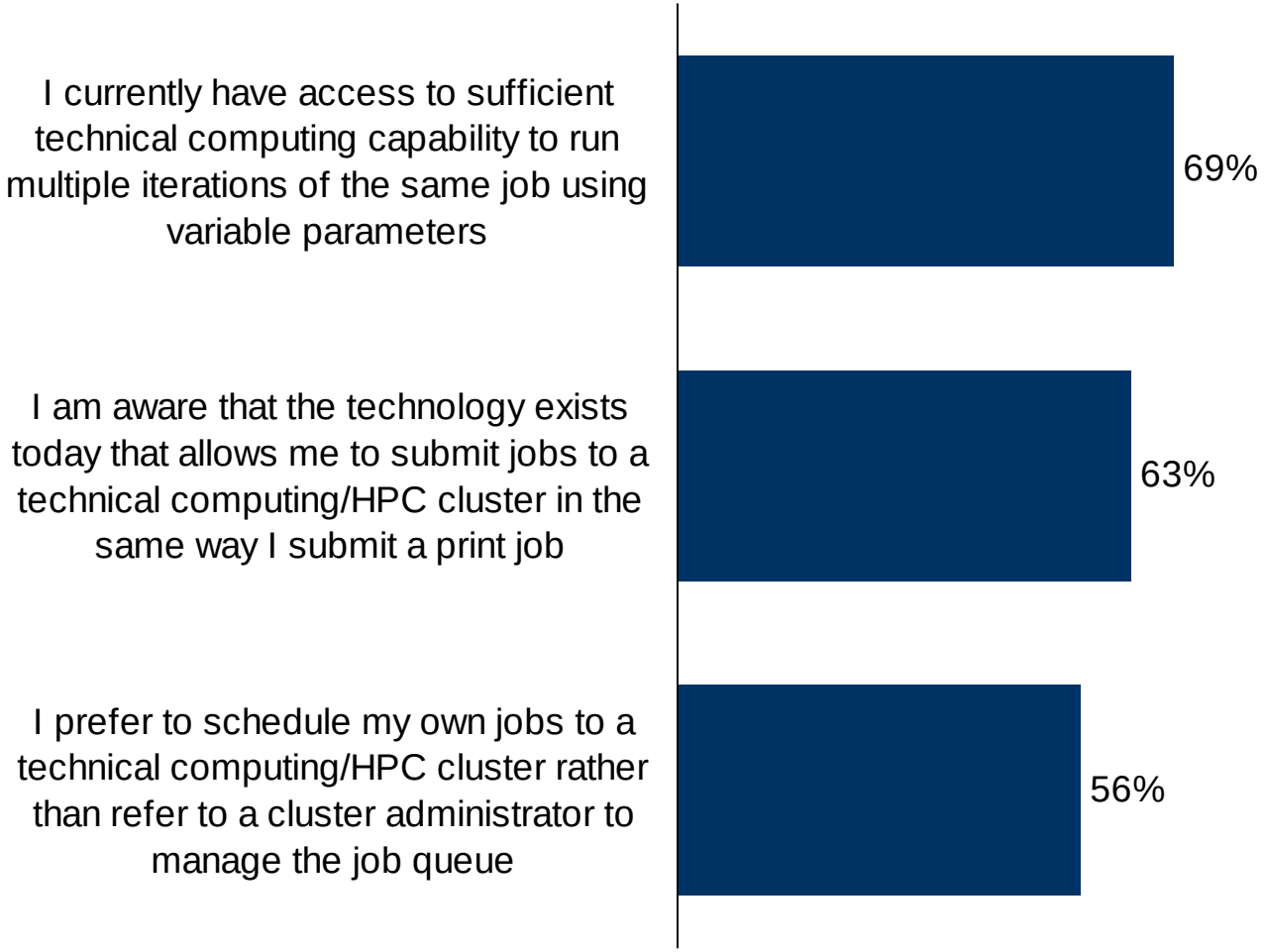
Most have sufficient access to computing power, are aware of HPC clusters, and prefer to schedule their own jobs

Please select the level to which you agree with the following statements:



n = 68-83

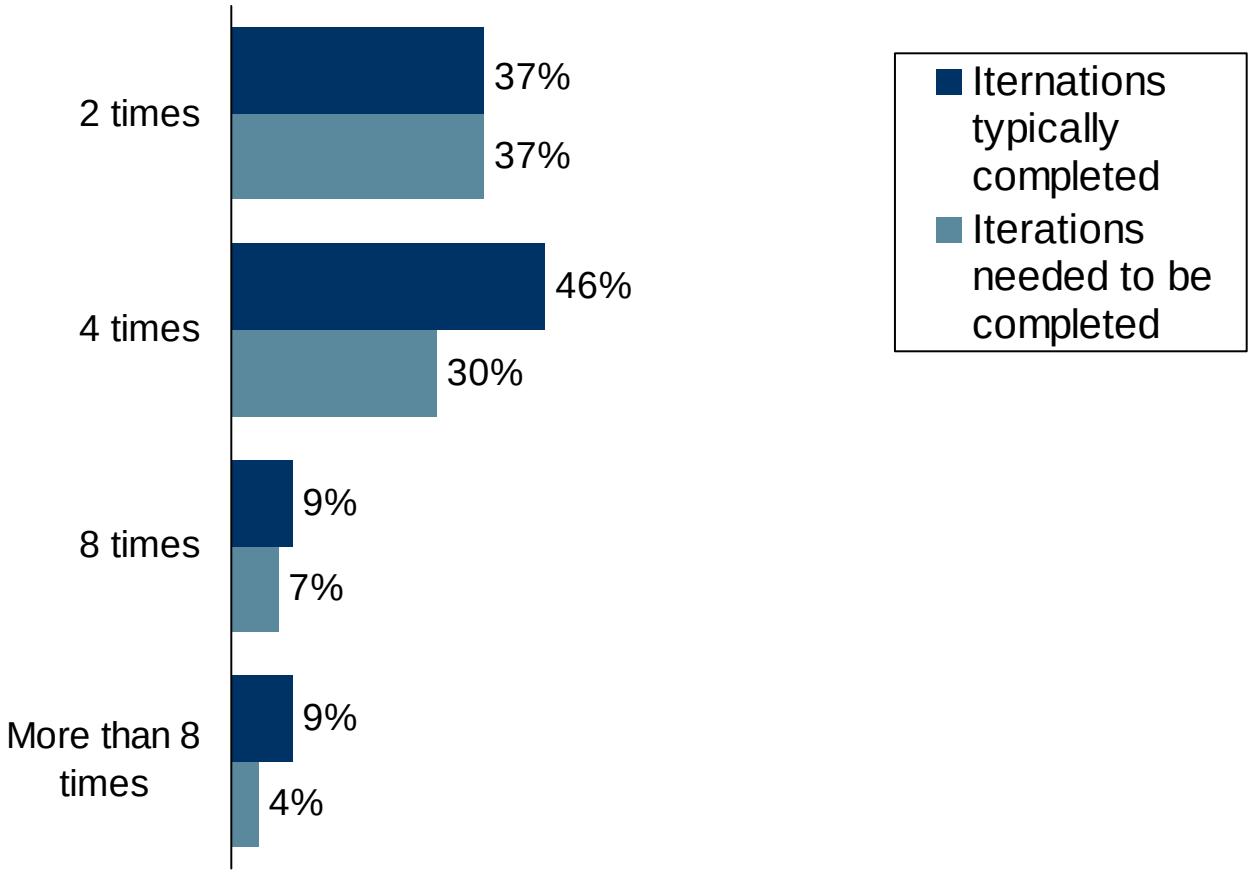
Q16

Microsoft

Gulf Research

The current iteration needs are being met with the number of iterations users can complete in a 24-hour day

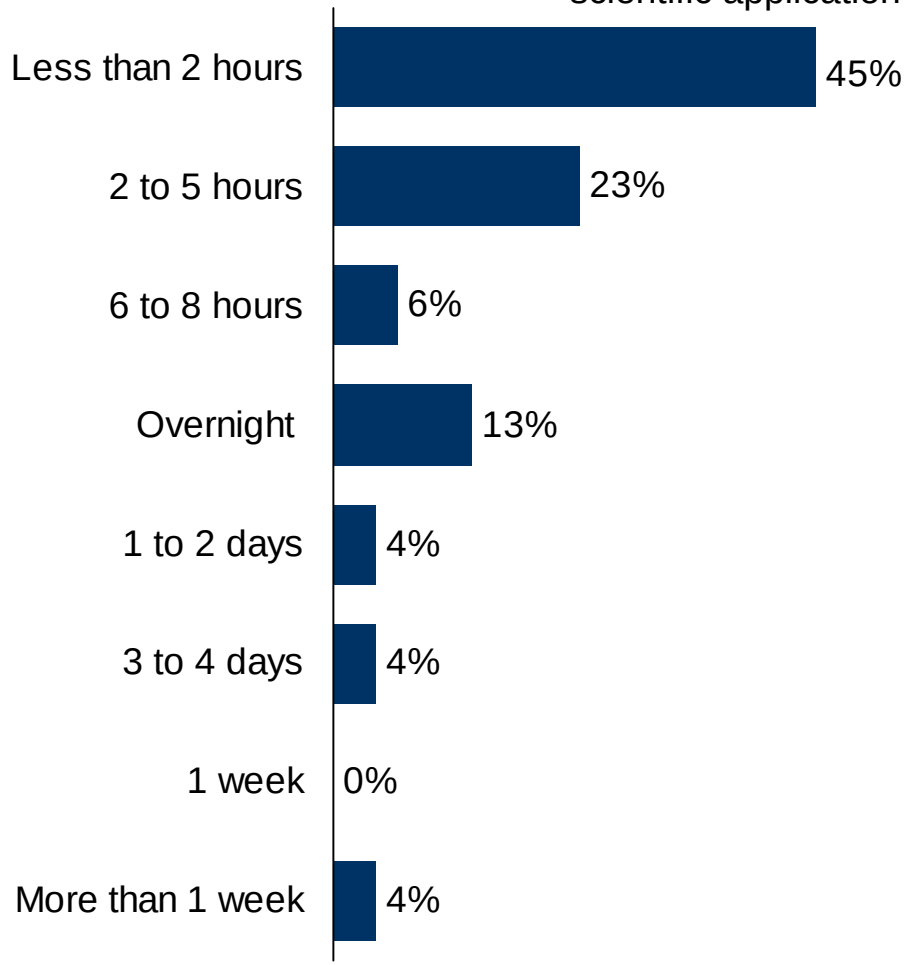
When running compute-intensive applications that require multiple iterations, how many iterations do you (typically complete) (need to complete) in a 24-hour day?



n = 46

Majority of compute-intensive scientific applications can be run in 5 hours or less

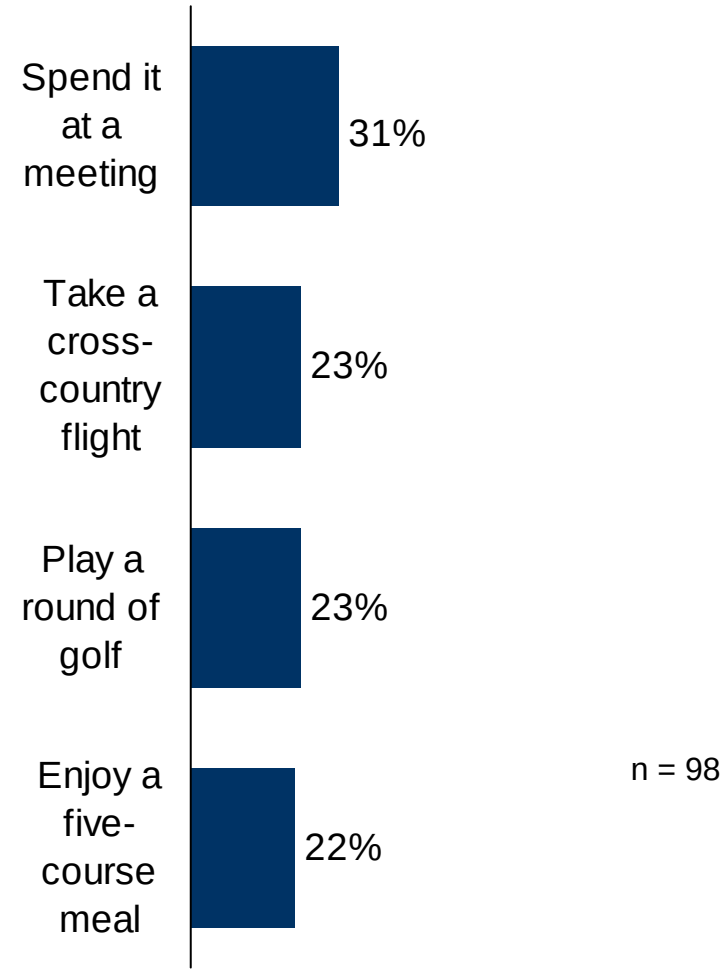
Which of the following best describes the amount of time you typically wait for a compute-intensive scientific application to run?



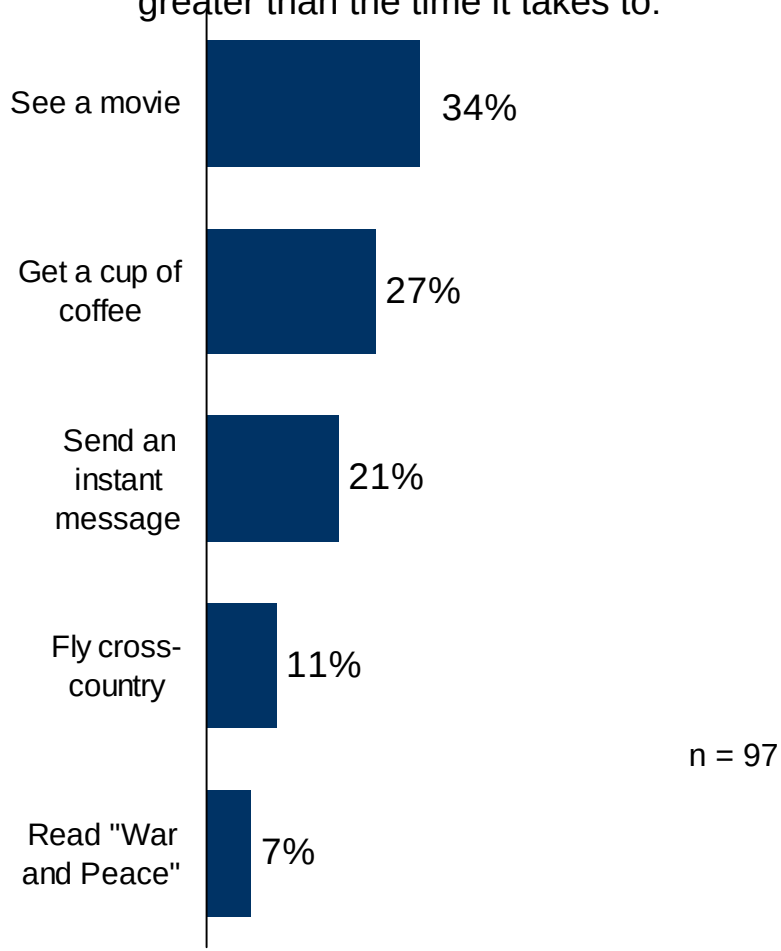
n = 47

Compute-intensive jobs usually run several hours

In the amount of time it takes to get a compute-intensive scientific job back, I would rather:



The amount of time it takes me to get a compute-intensive scientific job back is greater than the time it takes to:



Q27 & Q28

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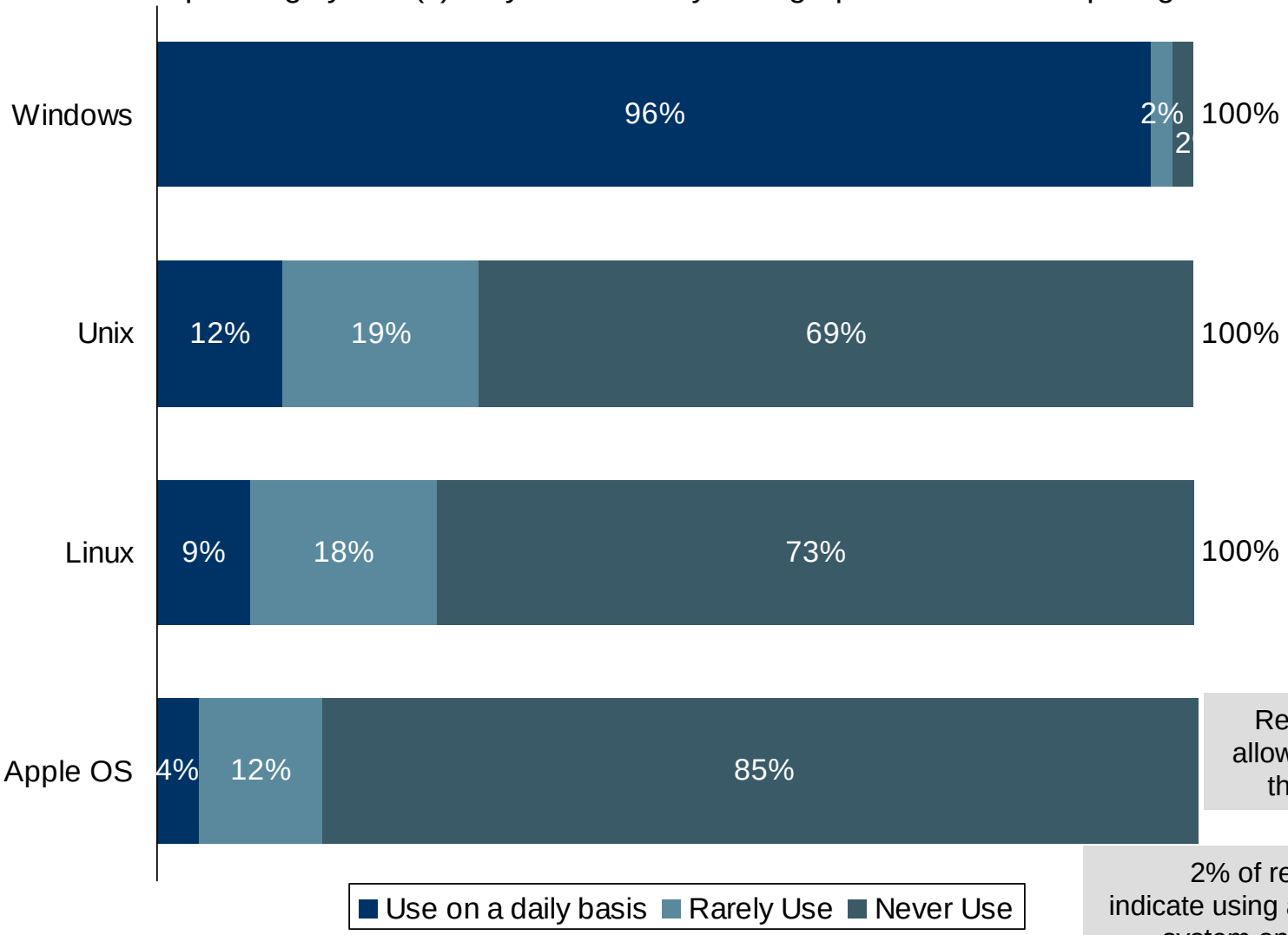
Detailed Findings

Operating system(s) utilized

Which operating system(s) do you utilize in your high-performance computing environment?



n = 104

Respondents were allowed to select more than one answer

2% of respondents indicate using another operating system on a daily basis

Microsoft

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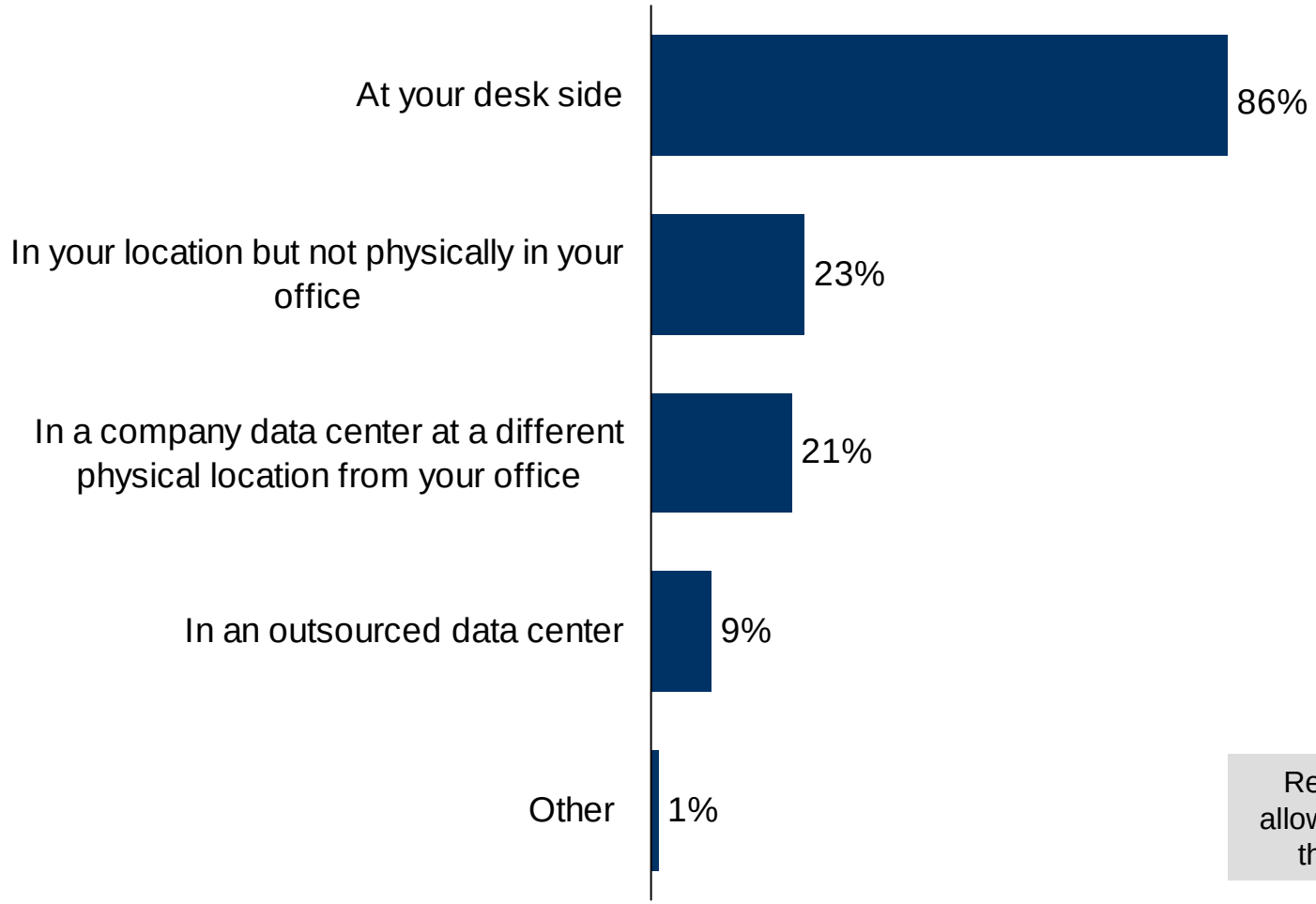
Current compute power location

The compute power that you need to do your job is: (Check all that apply)

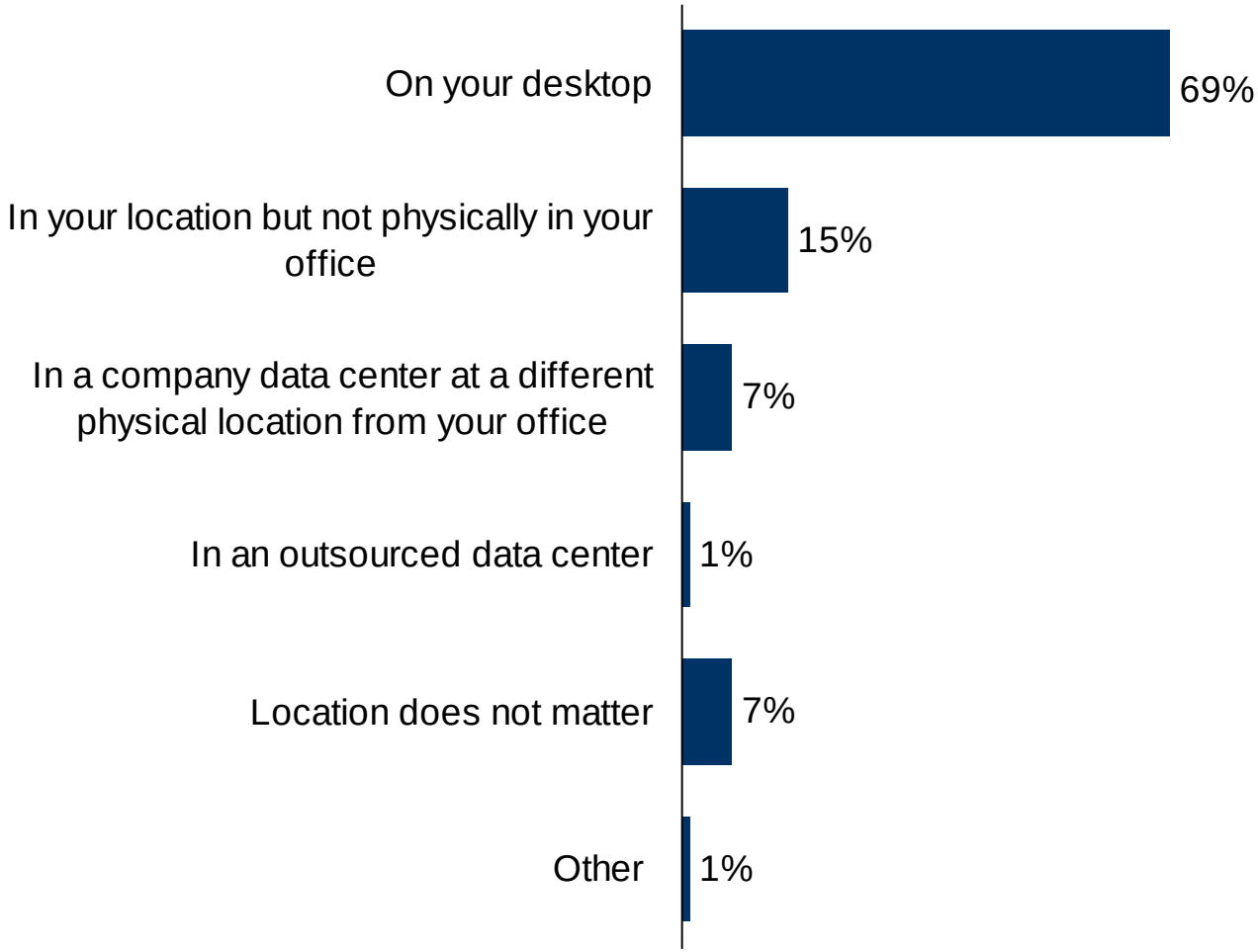


n = 77

Respondents were allowed to select more than one answer

Preferred compute power location

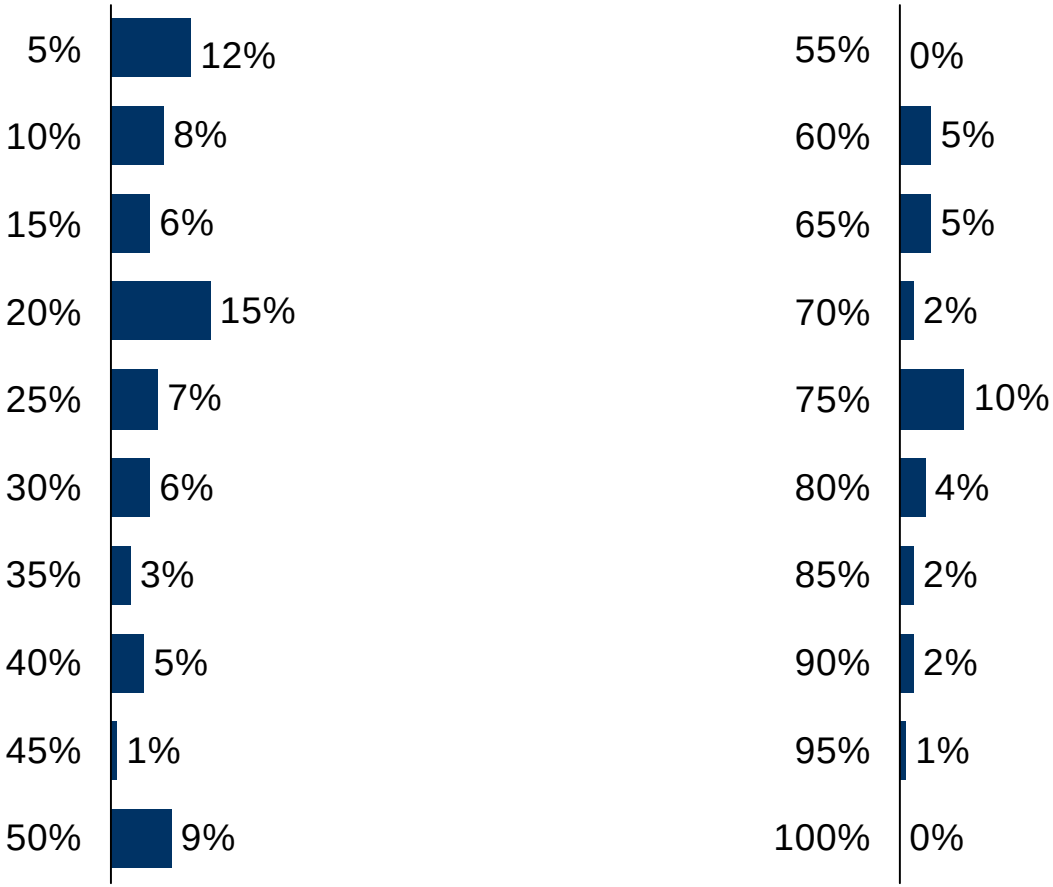
In terms of accessing the compute power you need to do your job, please select your most preferred location:



n = 104

Time spent on high performance technical computing functions

In a work week of 40 hours, what percentage of your time do you spend on high performance technical computing functions?

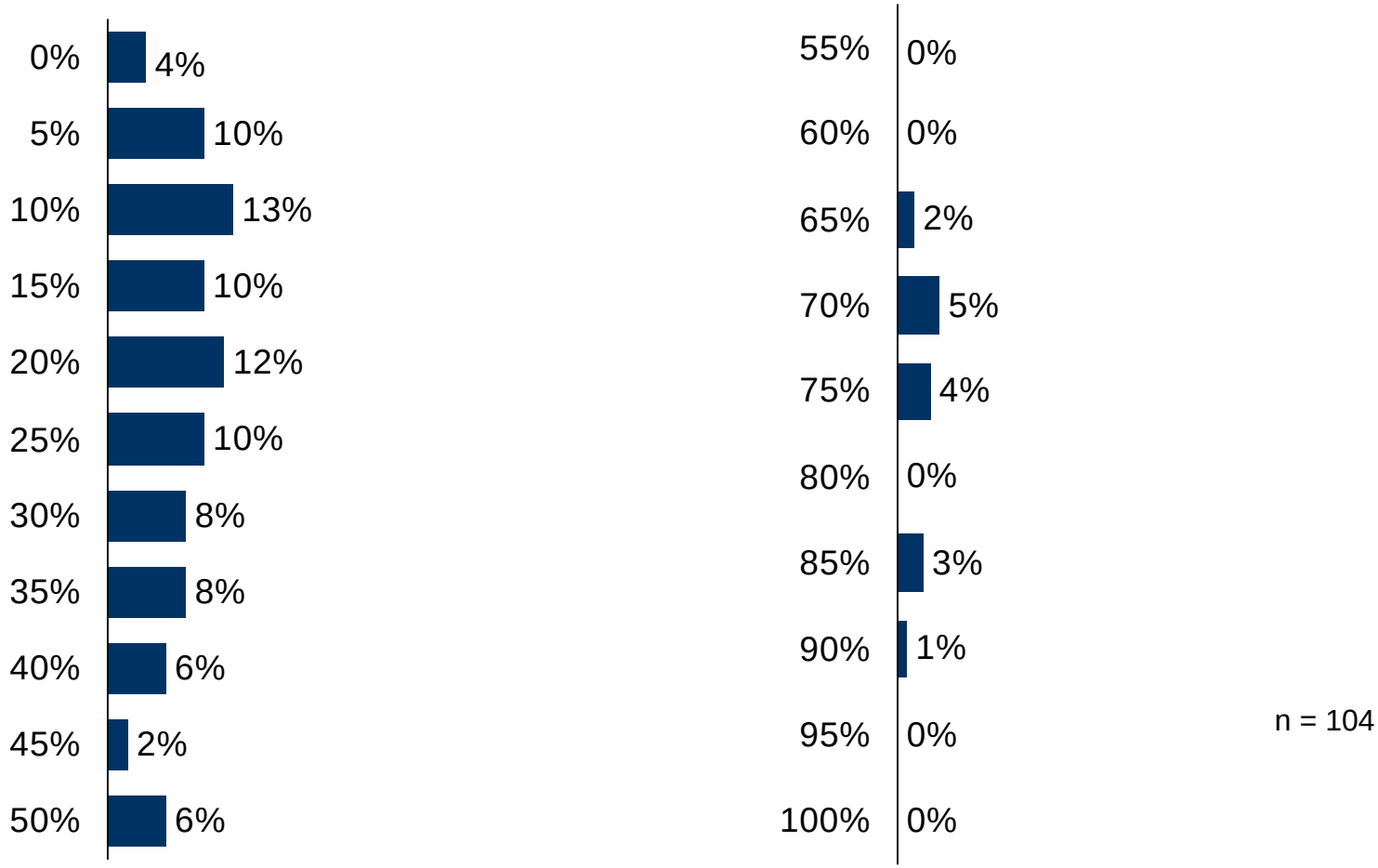


n = 103

Respondents selected a percentage in increments of 5, between 0% and 100%

Time spent manipulating and reporting technical data

What percentage of your time is spent manipulating and reporting technical data AFTER it is collected to make and present your final conclusions?

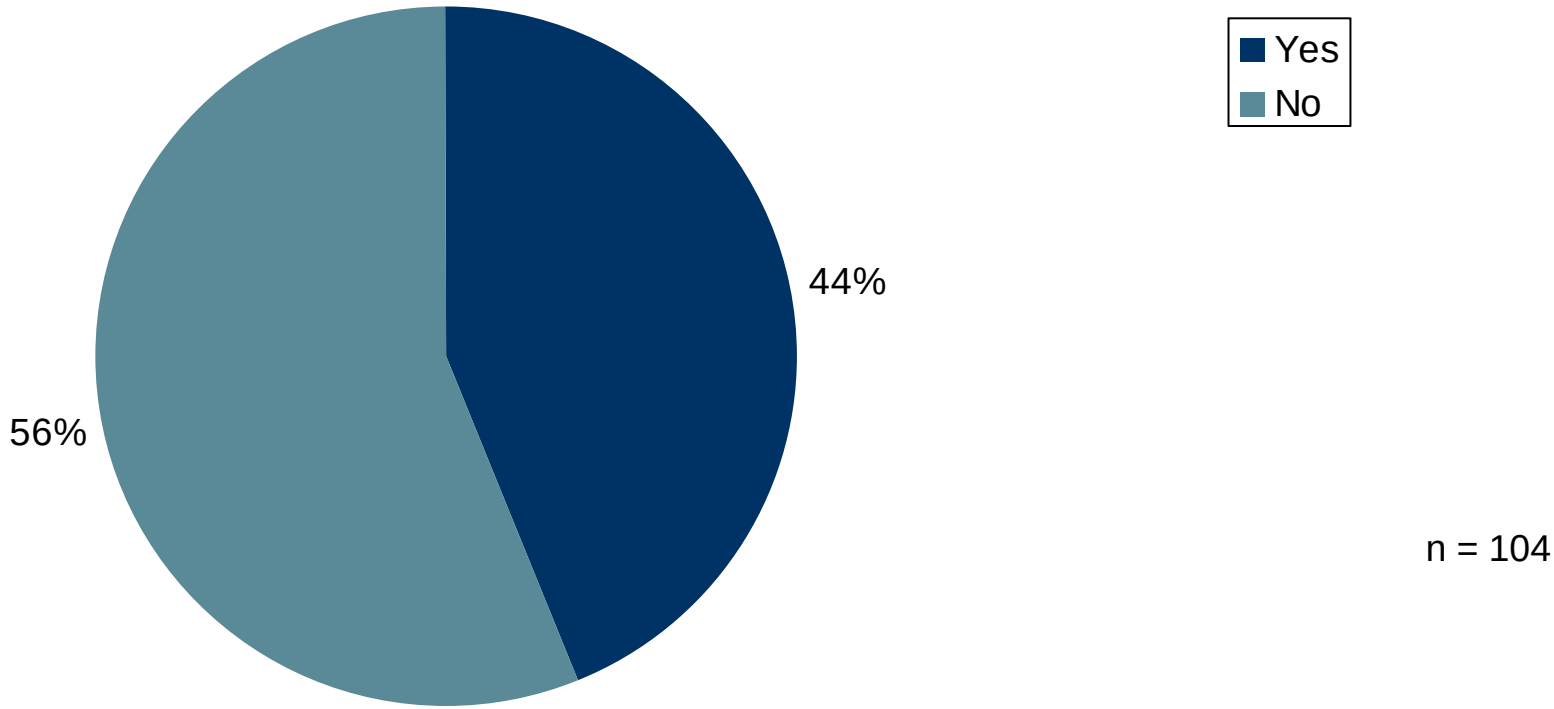


n = 104

Respondents selected a percentage in increments of 5, between 0% and 100%

Company or department unique applications

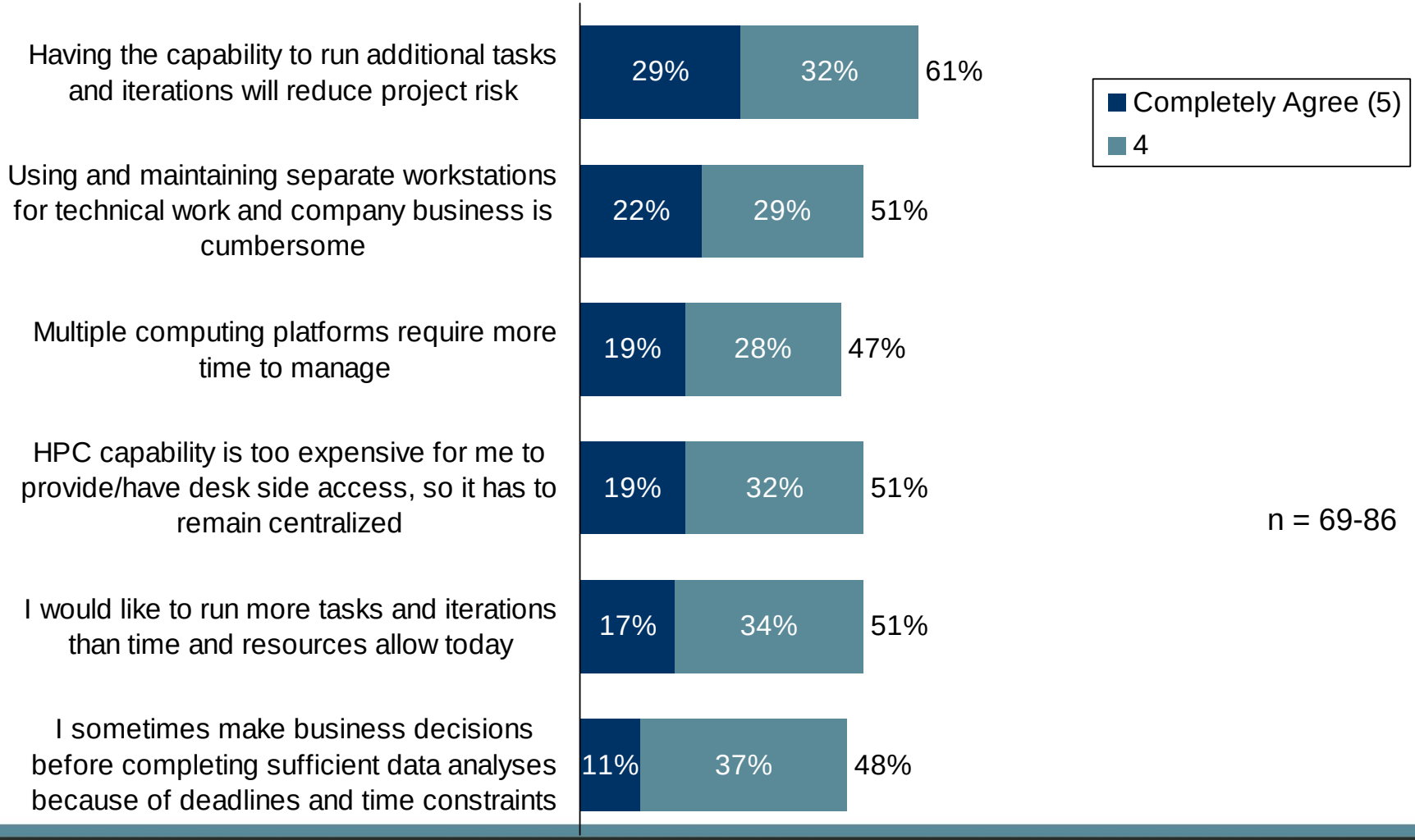
Do you have technical or scientific computing applications that are unique to your company or department?



n = 104

Statement agreement

Using a scale of 1 to 5, where 1 indicates completely disagree and 5 indicates completely agree, please indicate your level of agreement with each of the following statements:



Statement agreement

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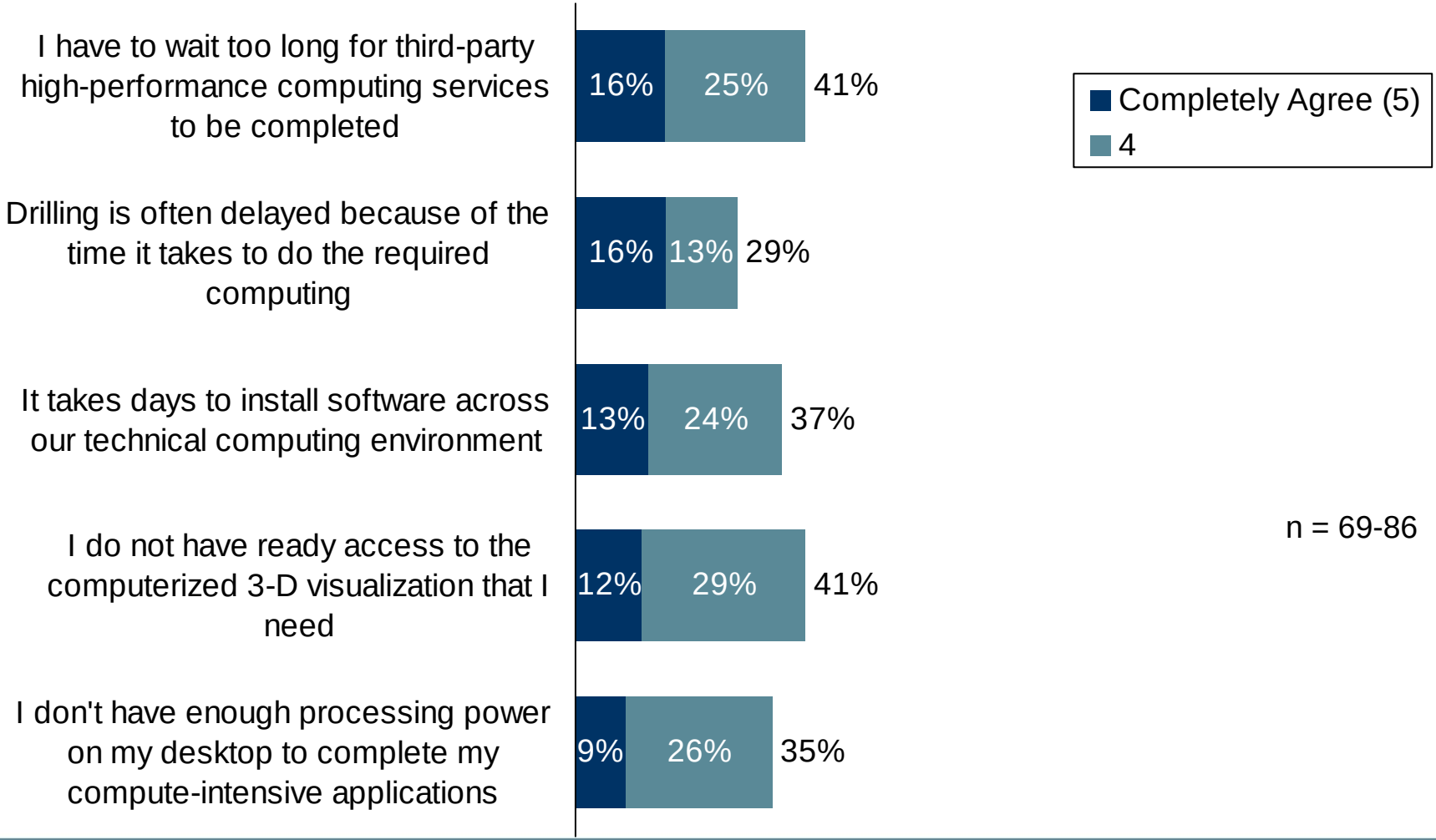
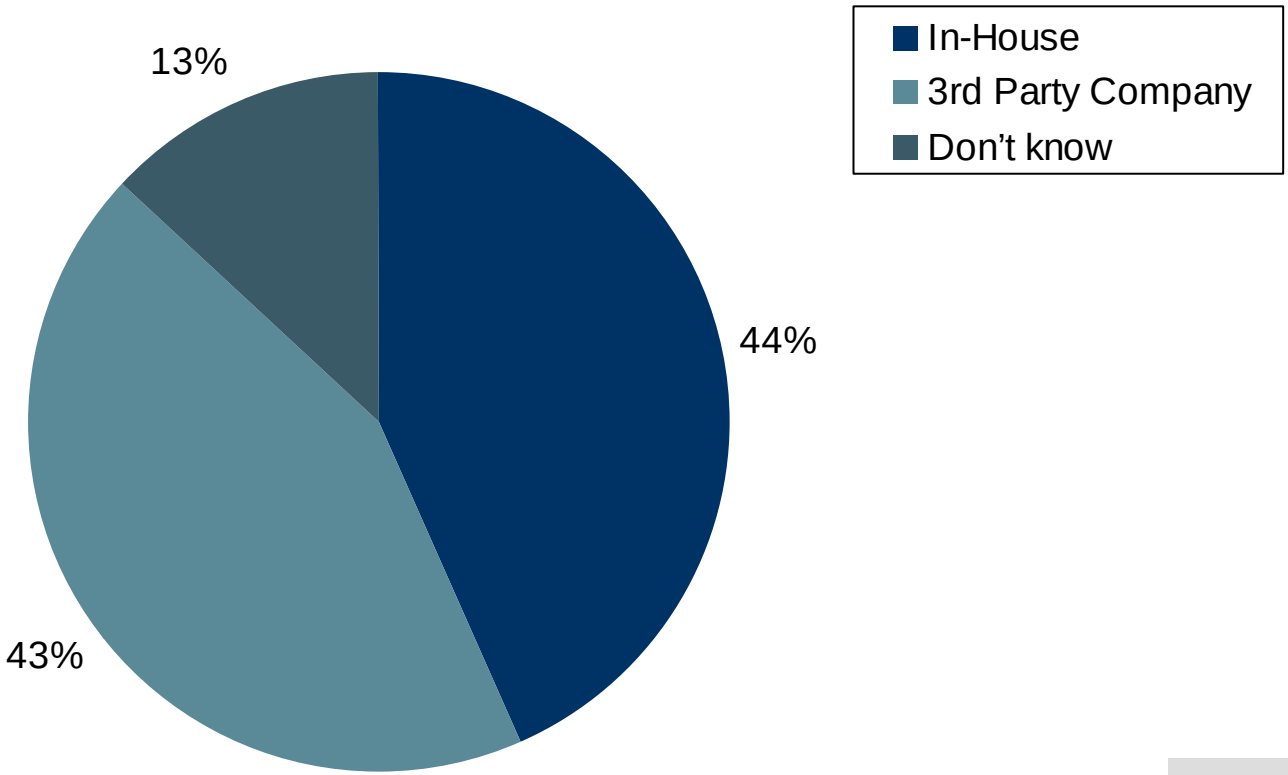


Computing application development

How were the technical or scientific computing applications that are unique to your company or department developed?

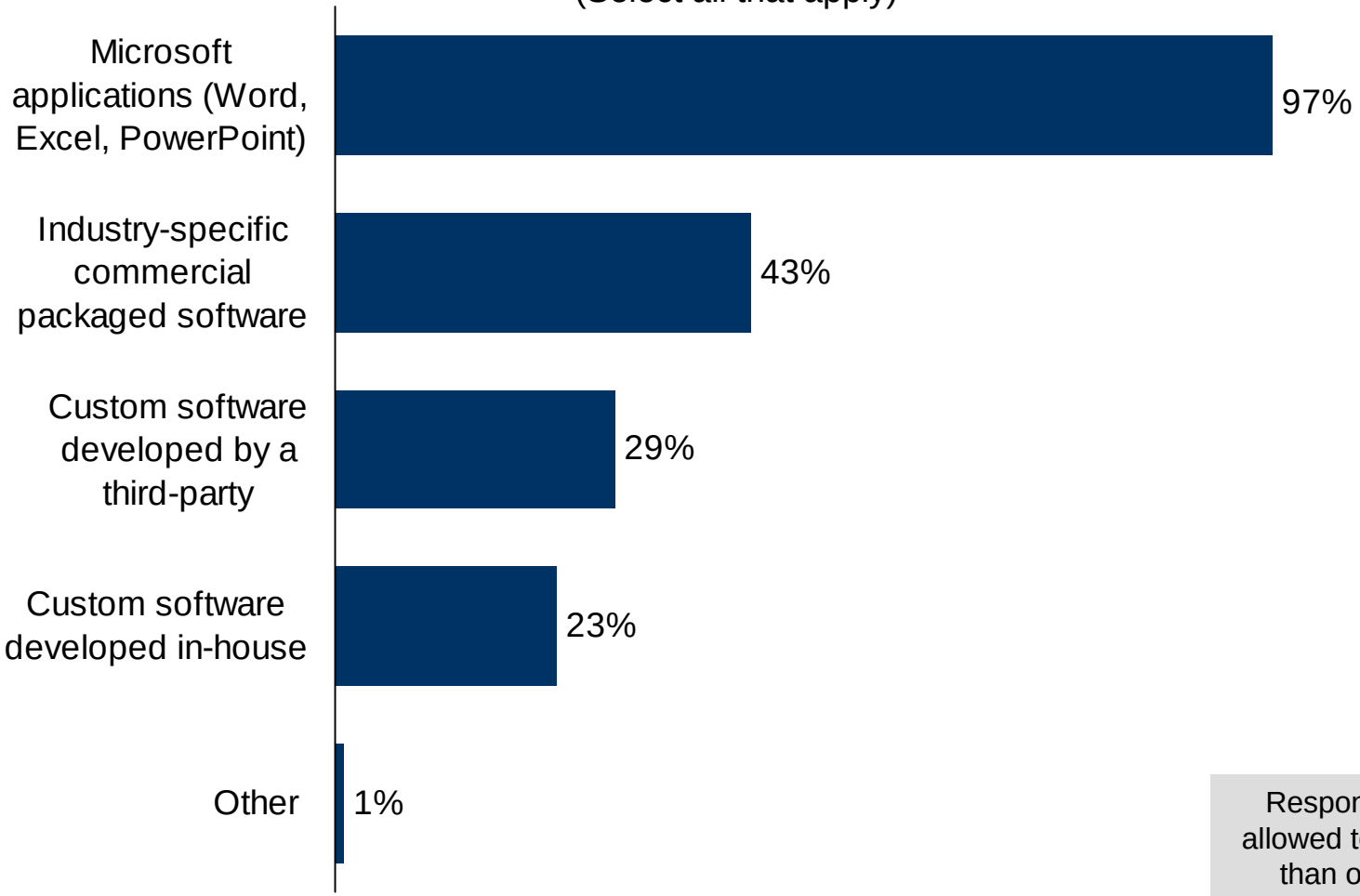


n = 46

Question only asked of those selecting yes in the previous question

Systems used to manipulate and report technical data

In which of the following software applications do you manipulate and report technical data?
(Select all that apply)

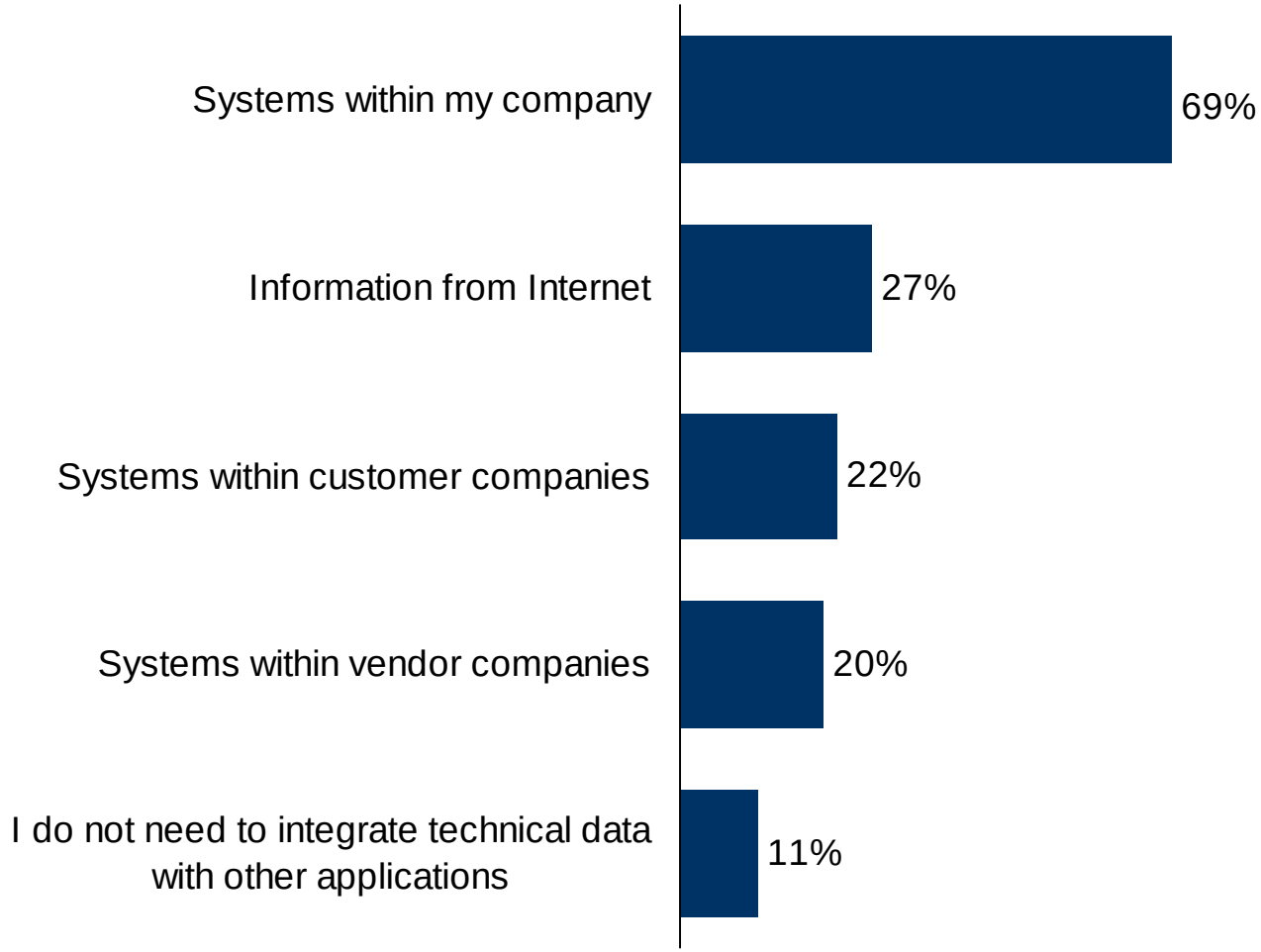


n = 104

Respondents were allowed to select more than one answer

Systems used to integrate technical data

From which type of systems do you commonly need to integrate your technical data? (Select all that apply)

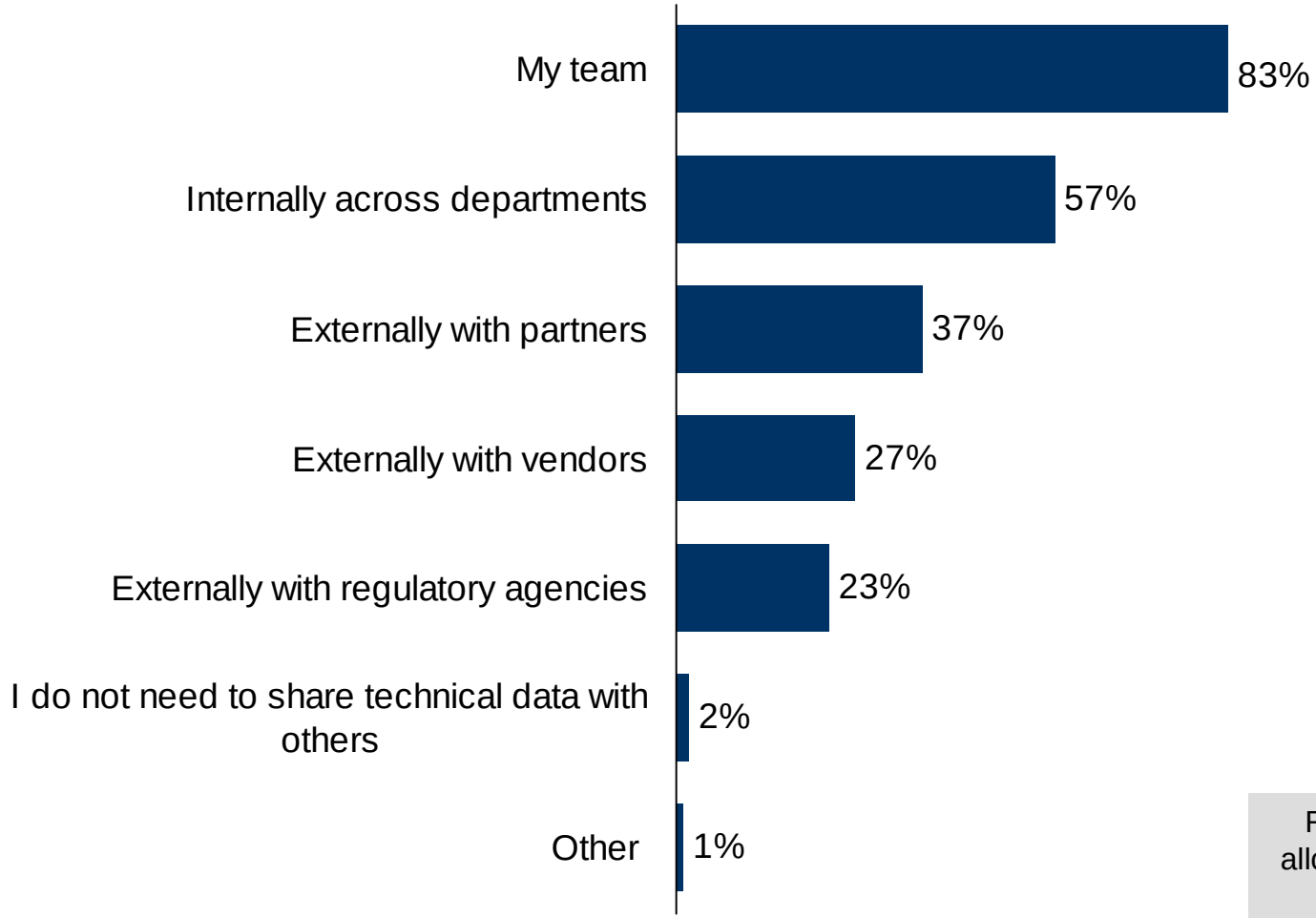


n = 104

Respondents were allowed to select more than one answer

Sharing technical data

Which of the following, if any, do you commonly need to share technical data with? (Select all that apply)

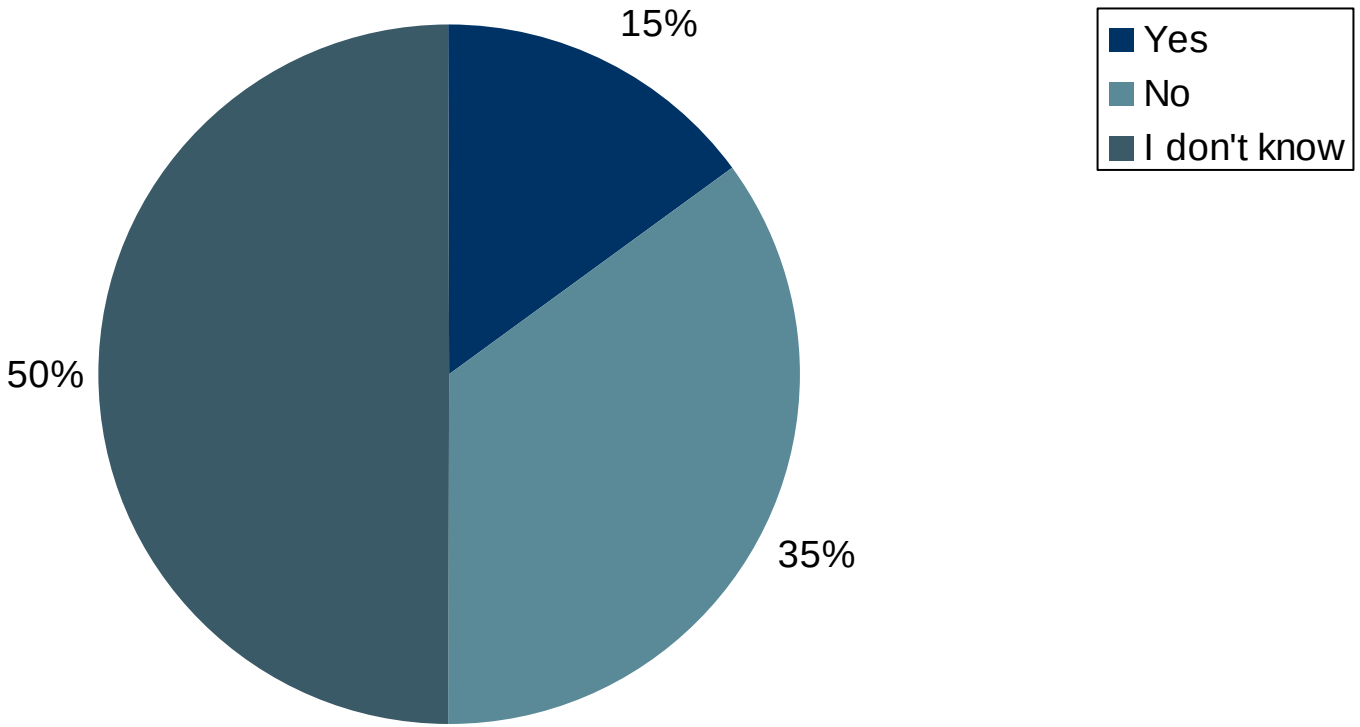


n = 104

Respondents were allowed to select more than one answer

Compute-intensive applications: parallelization

Do you use compute-intensive applications today that are not parallelized, yet you require parallel technology for your job?



n = 104

Compute-intensive applications requiring parallelization

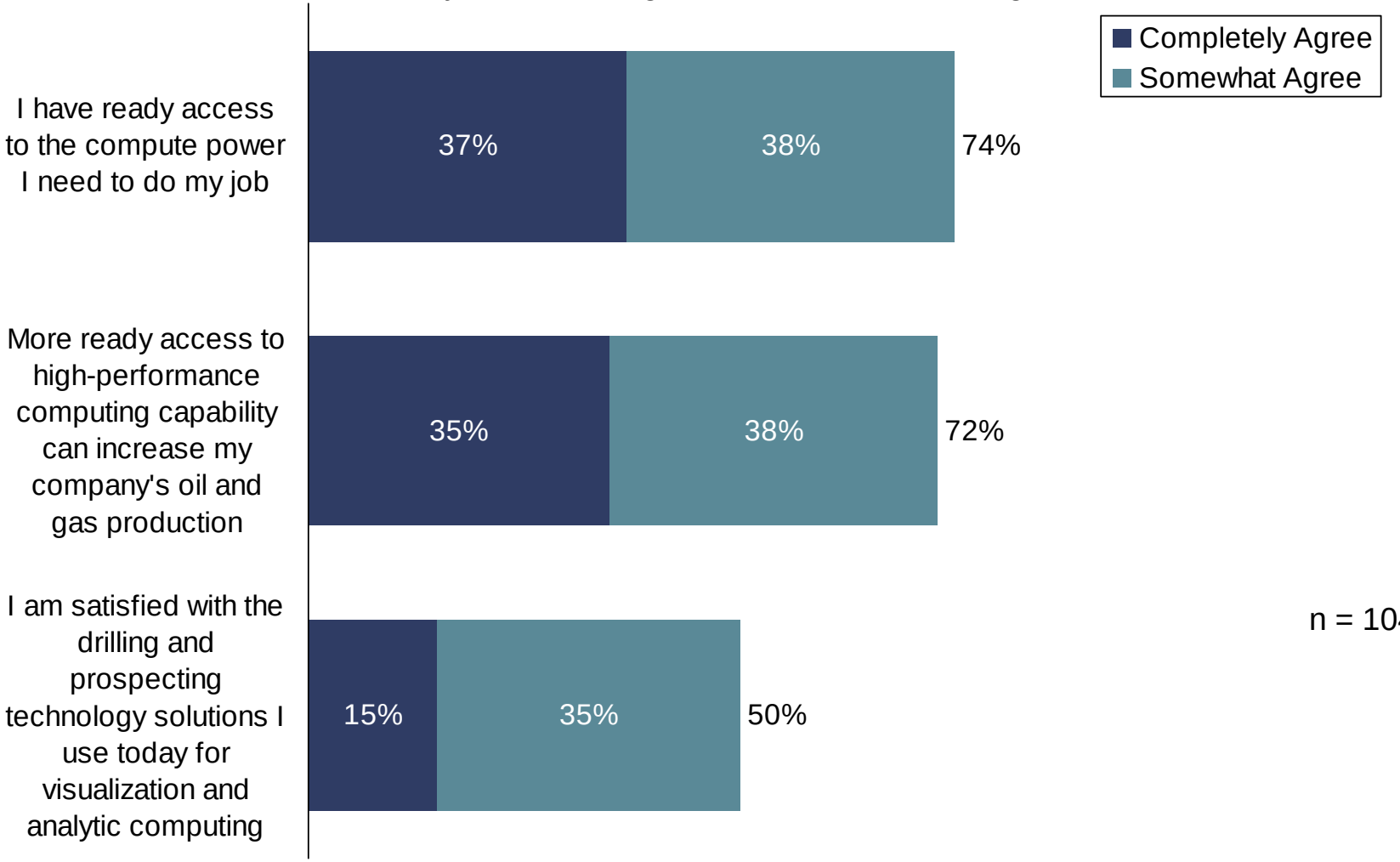
Please describe the compute–intensive applications you use that require parallelization for cluster computing.

- 3D seismic depth migration
- 3D volume visualization reservoir simulation
- HFPT (MoReS), dynamic simulator with coupling on subsurface and surface network
- Monte Carlo Simulation to compute reserves
- Reservoir simulation/simulator
- Advanced and updated applications

Open-ended response question

Statement agreement

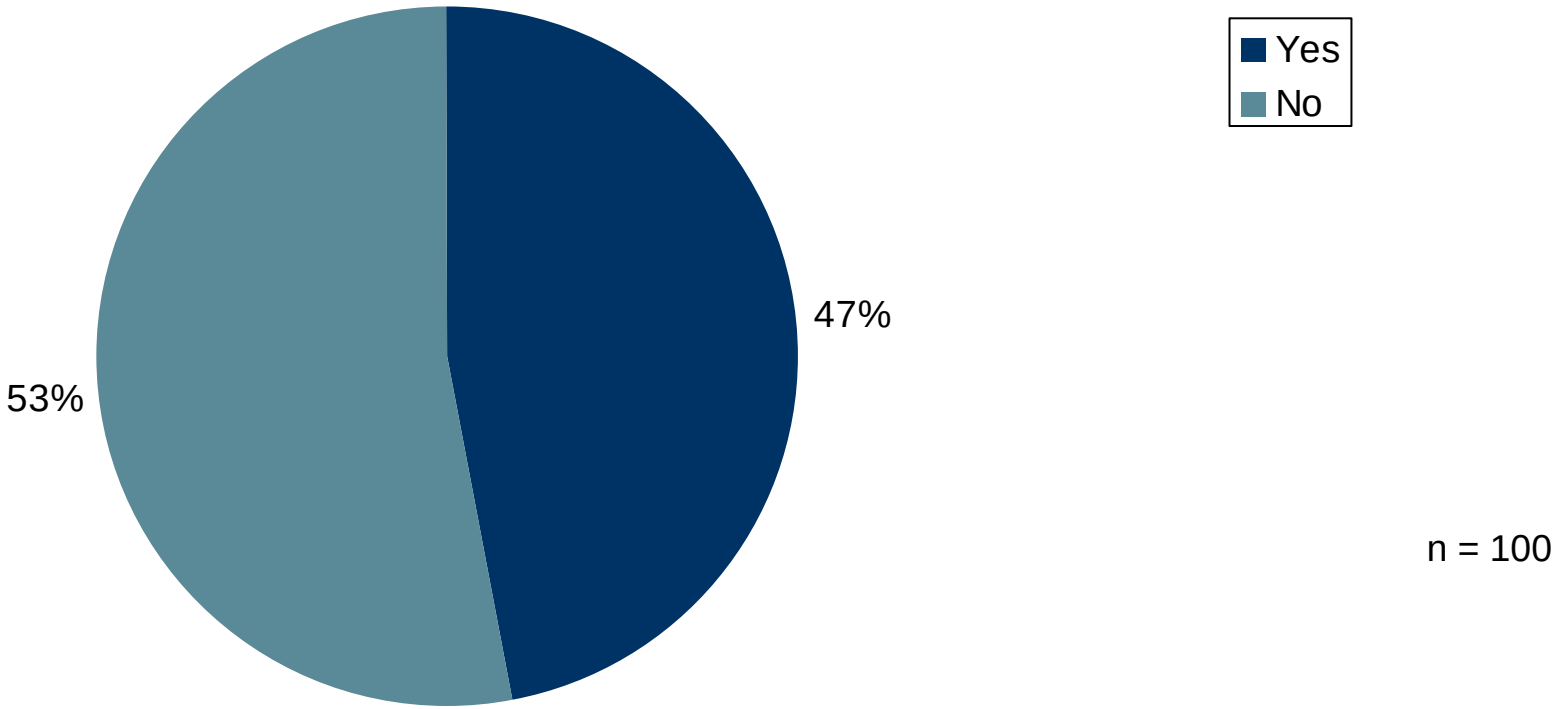
Please indicate your level of agreement with the following statements:



n = 104

Compute-intensive scientific applications: multiple iterations

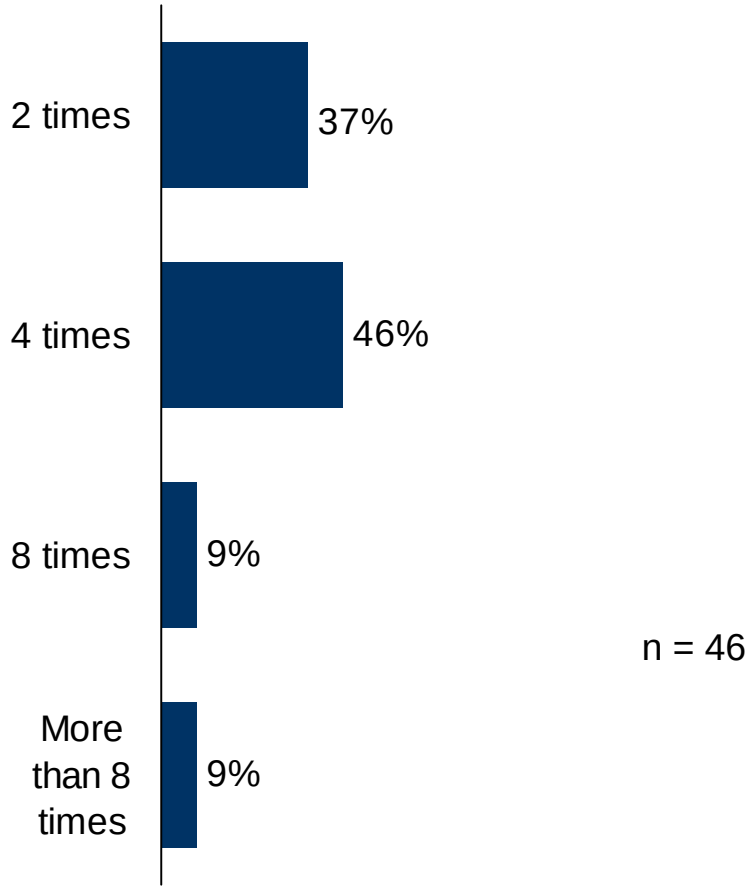
Do your compute-intensive scientific applications require multiple iterations?



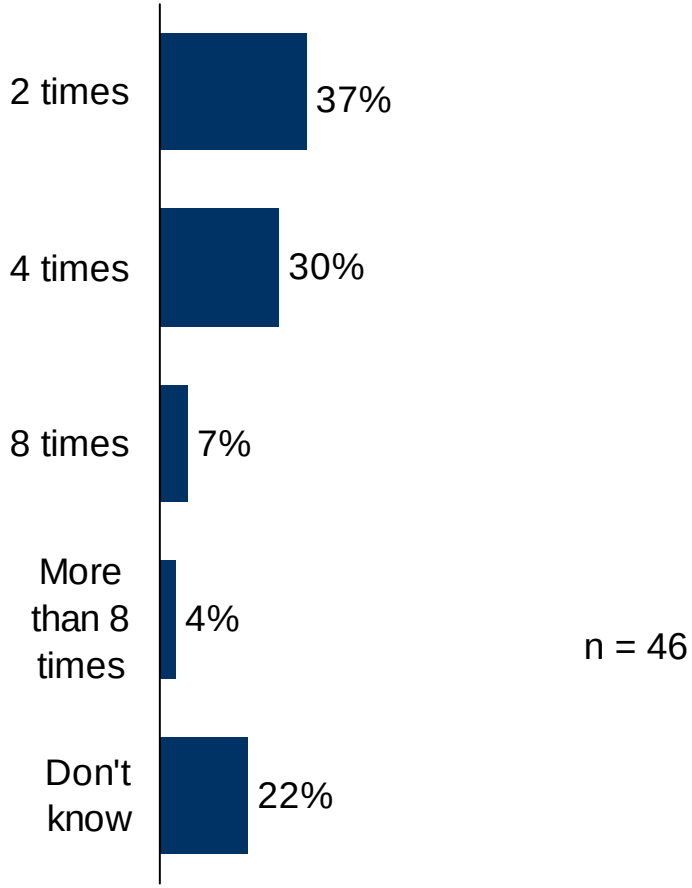
n = 100

Number of multiple iterations needed per day

When running compute-intensive applications that require multiple iterations, how many iterations do you typically complete in a 24-hour day?

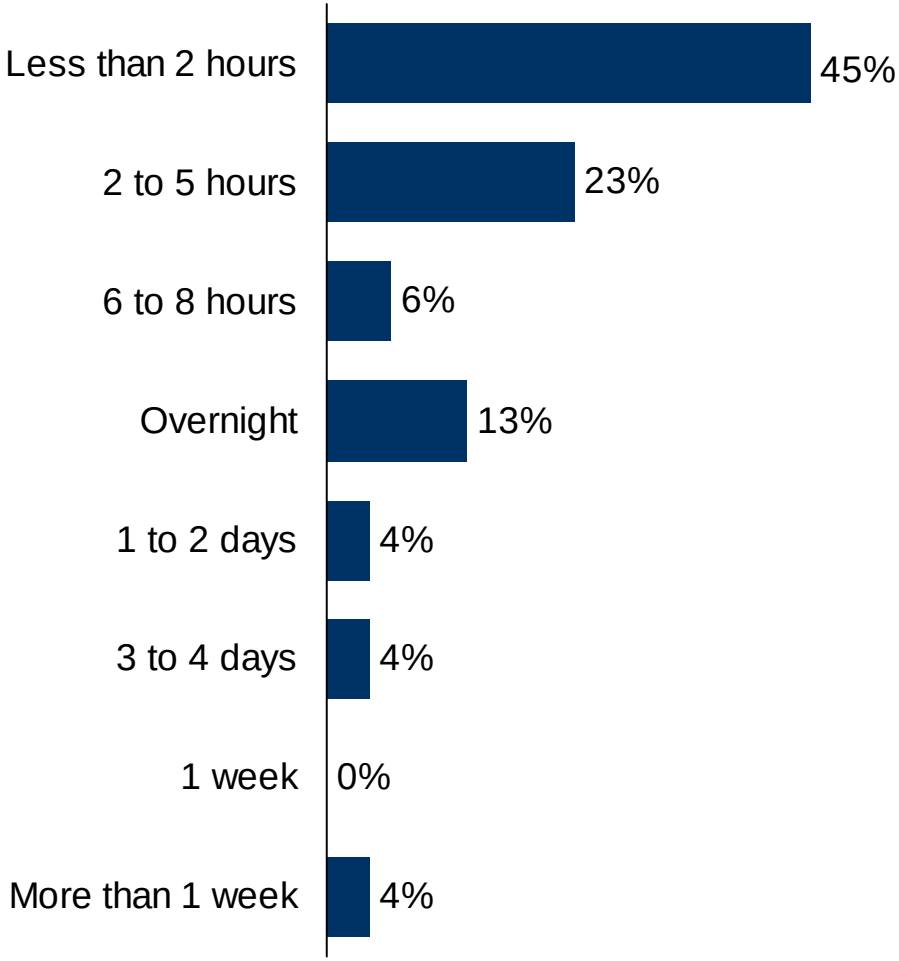


When running compute-intensive applications that require multiple iterations, how many iterations do you need to complete in a typical day?



Wait time for a compute-intensive scientific application

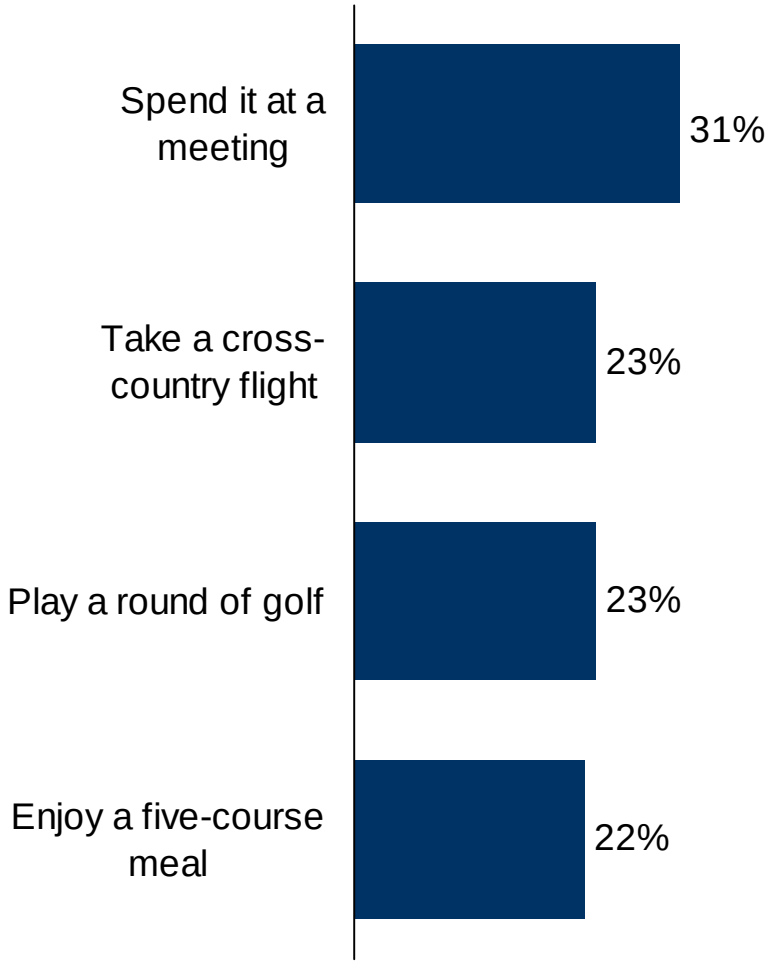
Which of the following best describes the amount of time you typically wait for a compute-intensive scientific application to run?



n = 47

I would rather…

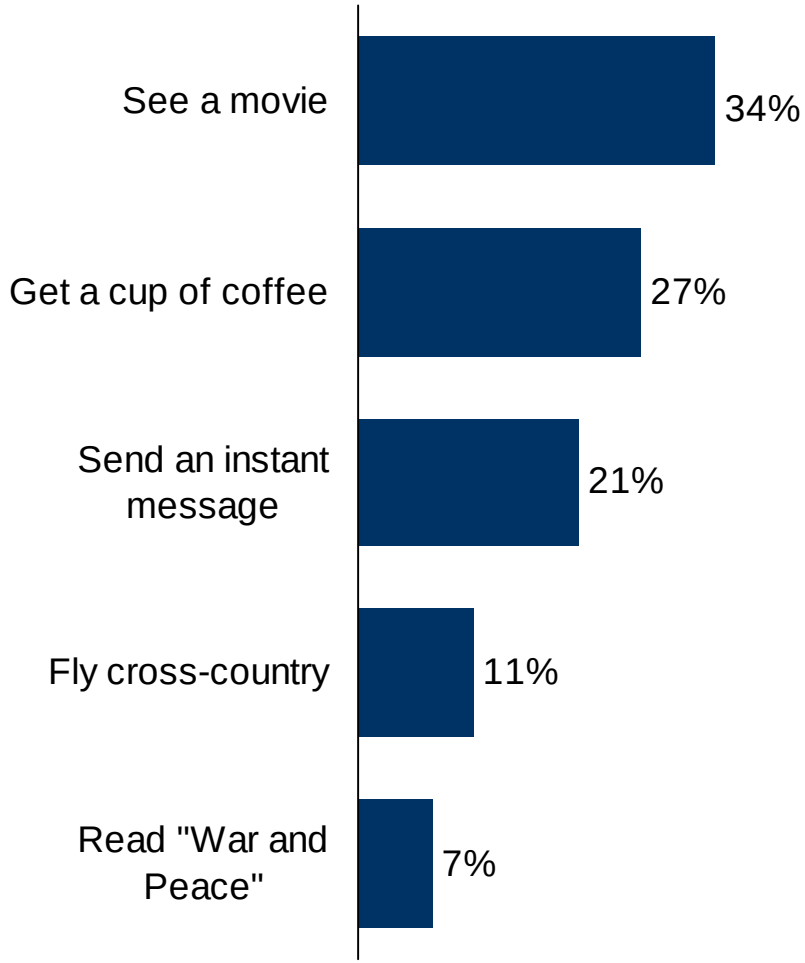
In the amount of time it takes to get a compute-intensive scientific job back, I would rather:



n = 98

Compute-intensive scientific jobs take more time than…

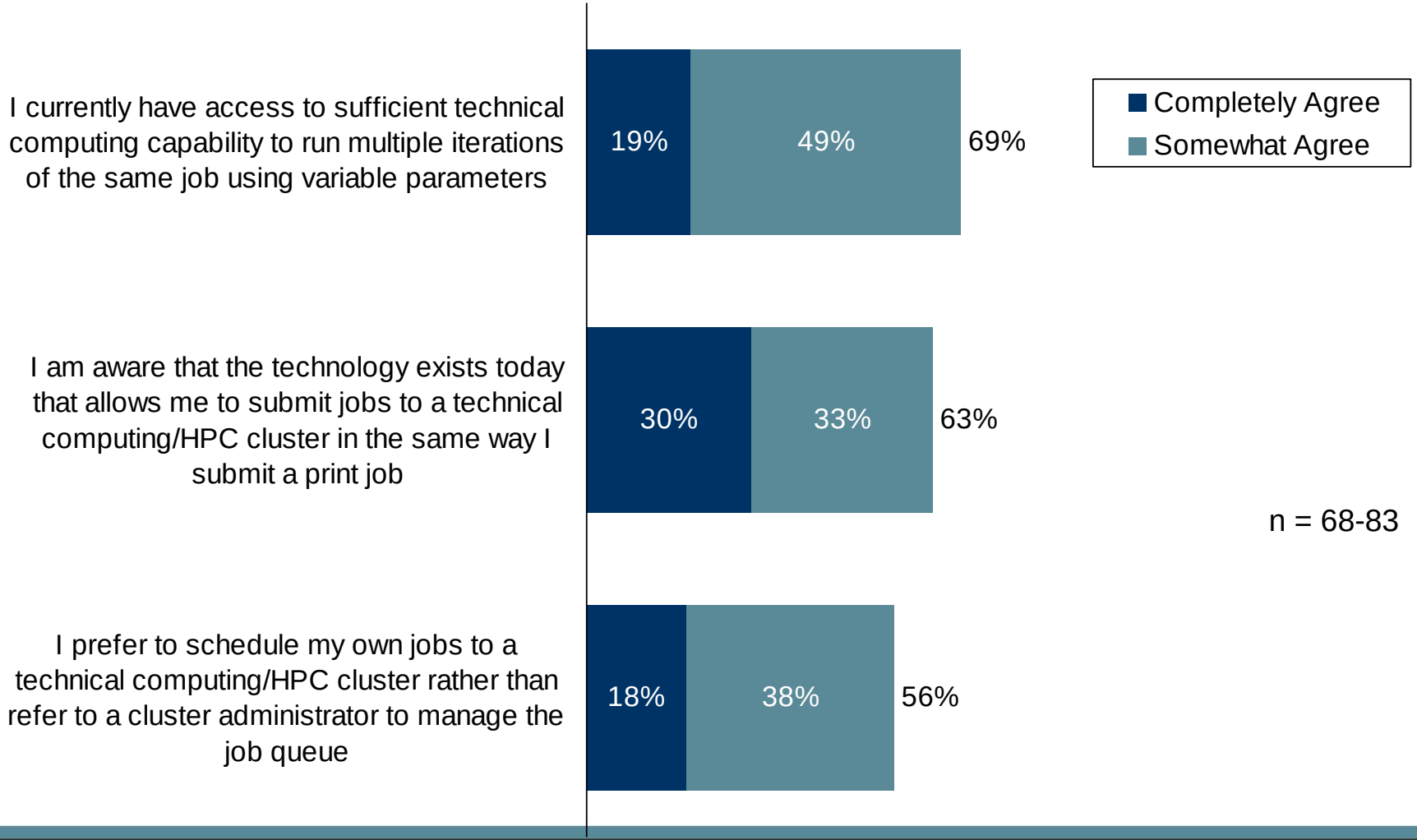
The amount of time it takes me to get a compute-intensive scientific job back is greater than the time it takes to:



n = 97

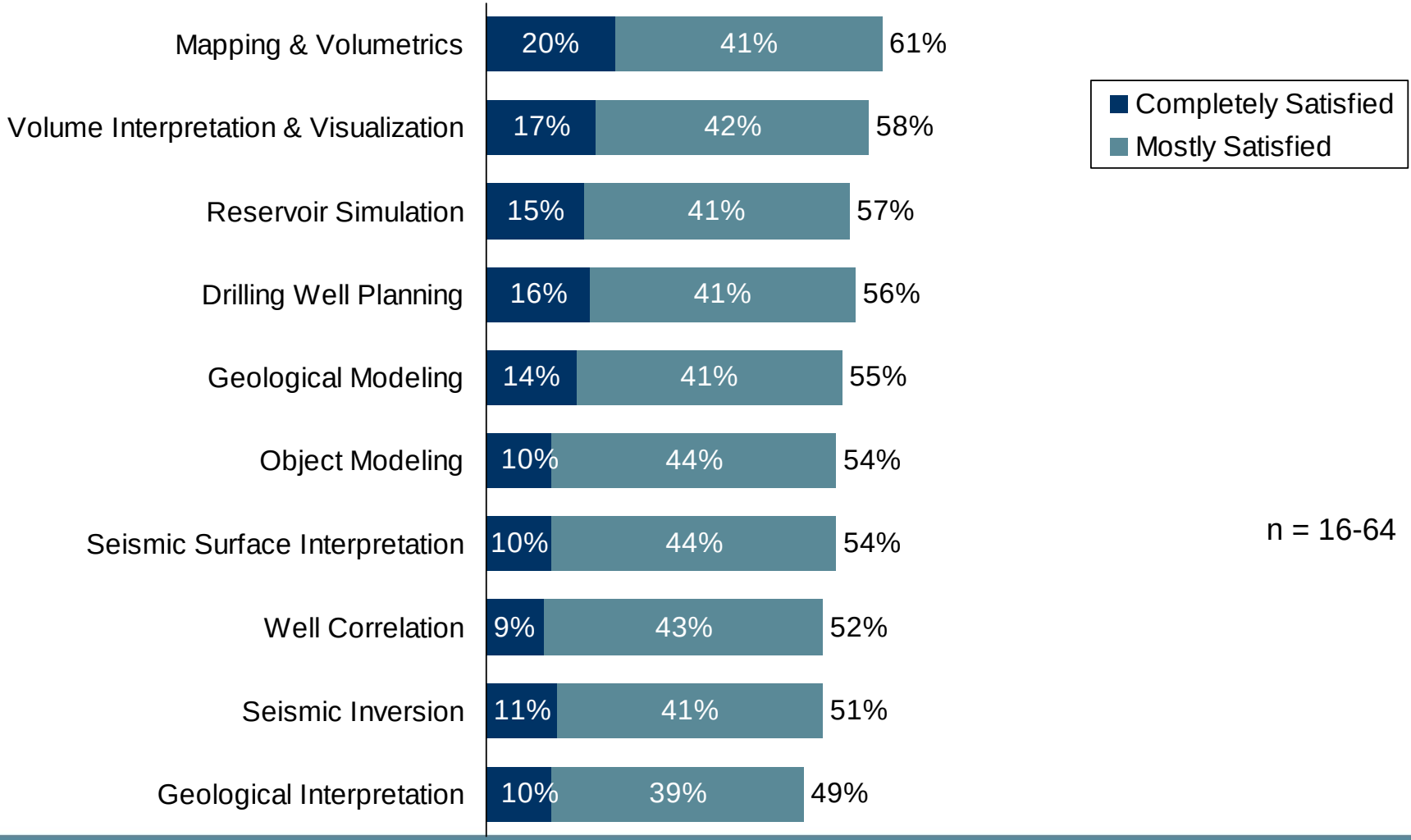
Statement agreement

Please select the level to which you agree with the following statements:



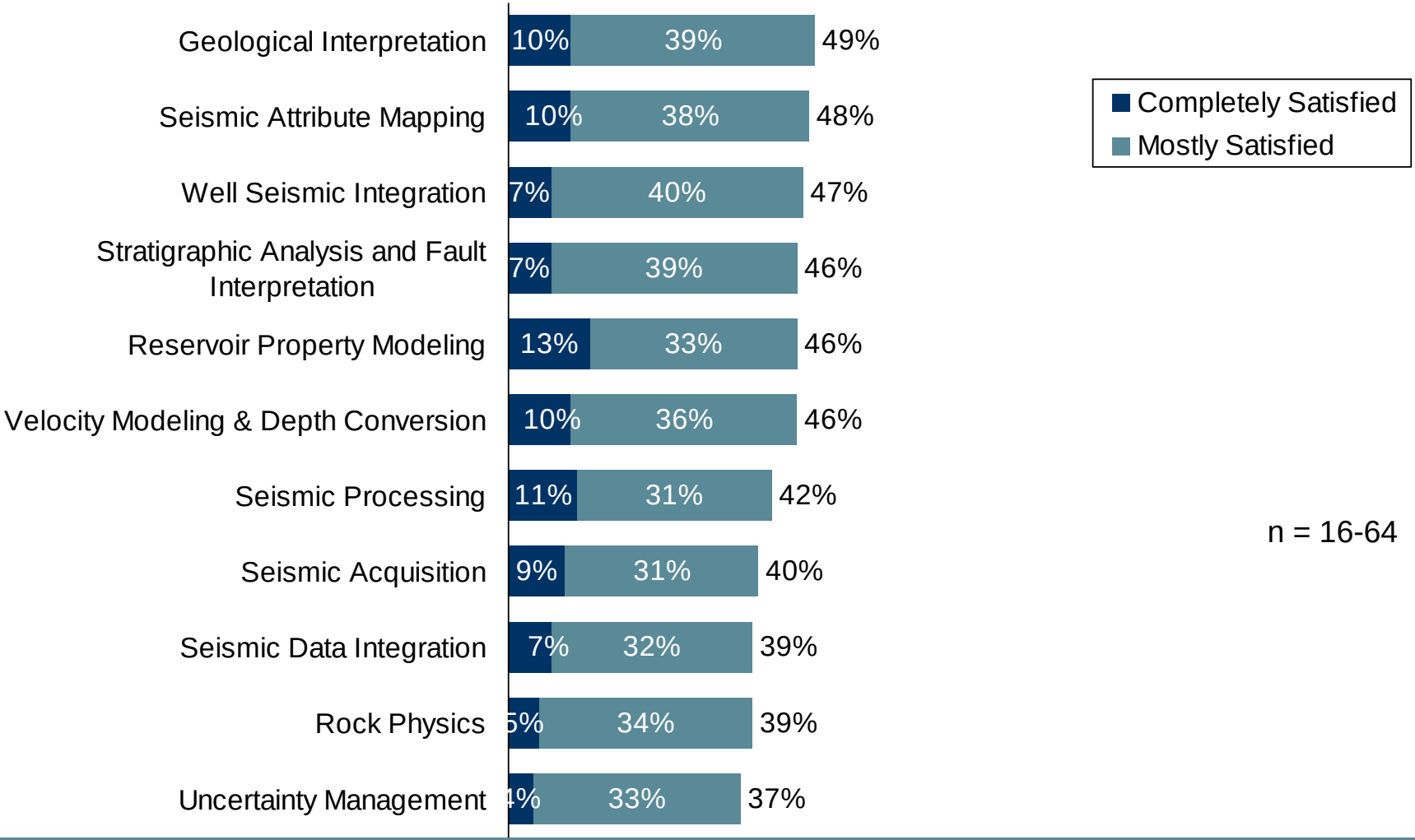
Satisfaction with current computing capabilities

How satisfied are you with the performance of your current technical computing capabilities for the following applications:



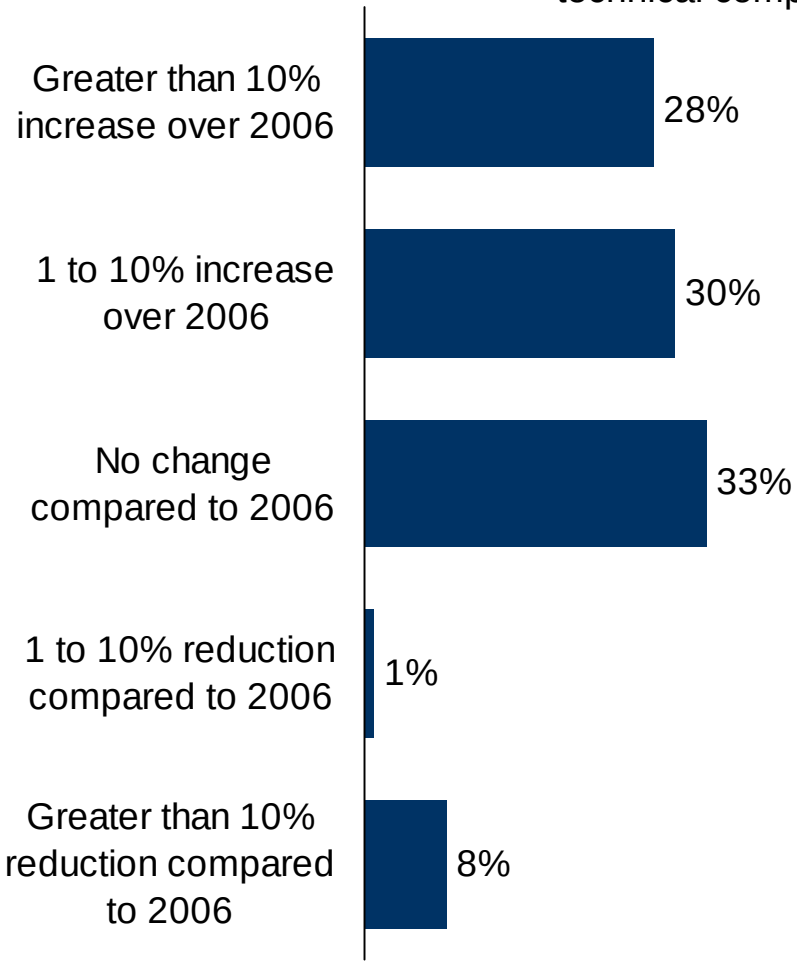
Satisfaction with current computing capabilities (continued)

How satisfied are you with the performance of your current technical computing capabilities for the following applications:



2007 budget for technical computing hardware and software

Please select the response that best describes your company's budget for hardware and software for technical computing in 2007:

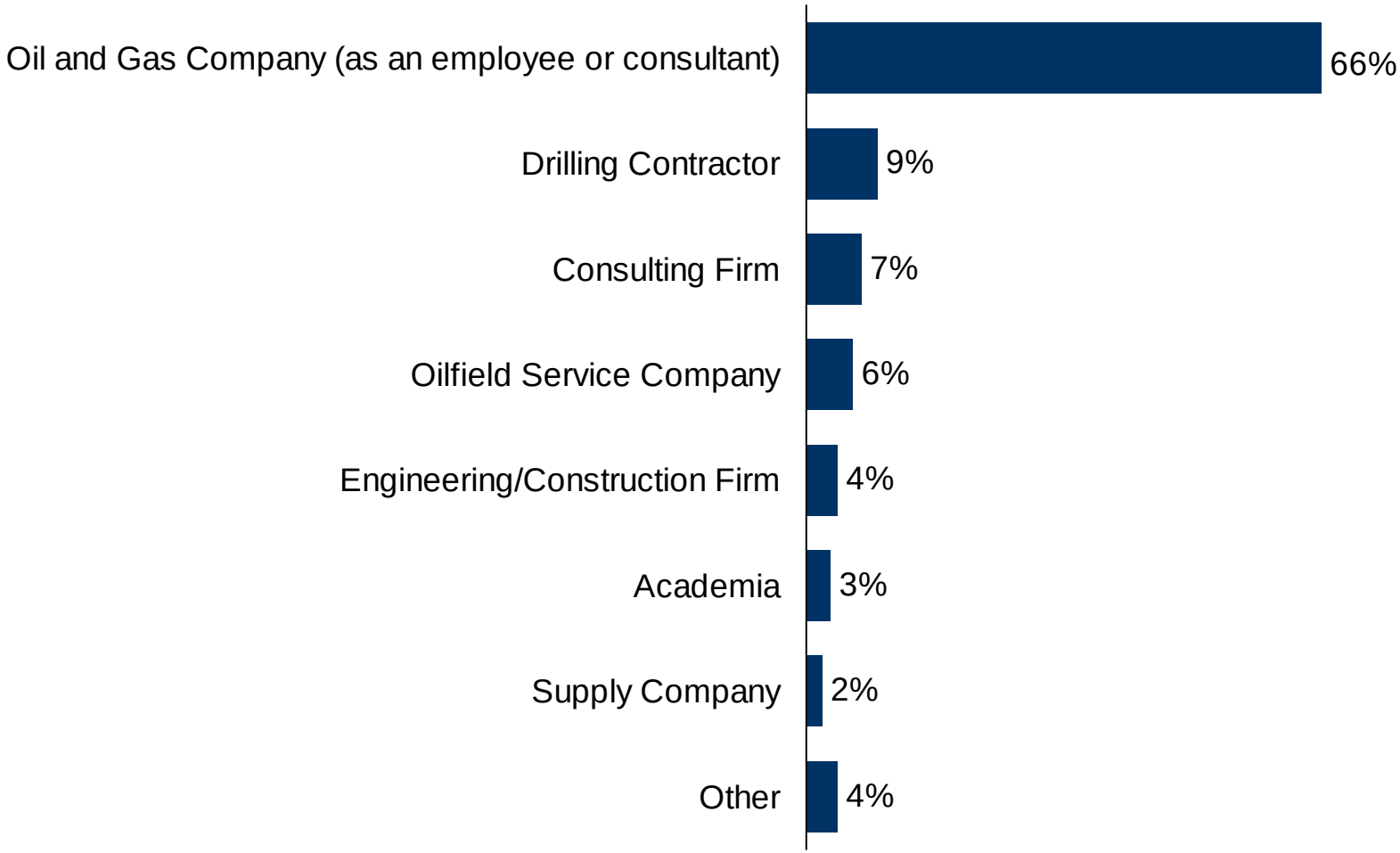


n = 79

Respondent Demographics

Company type

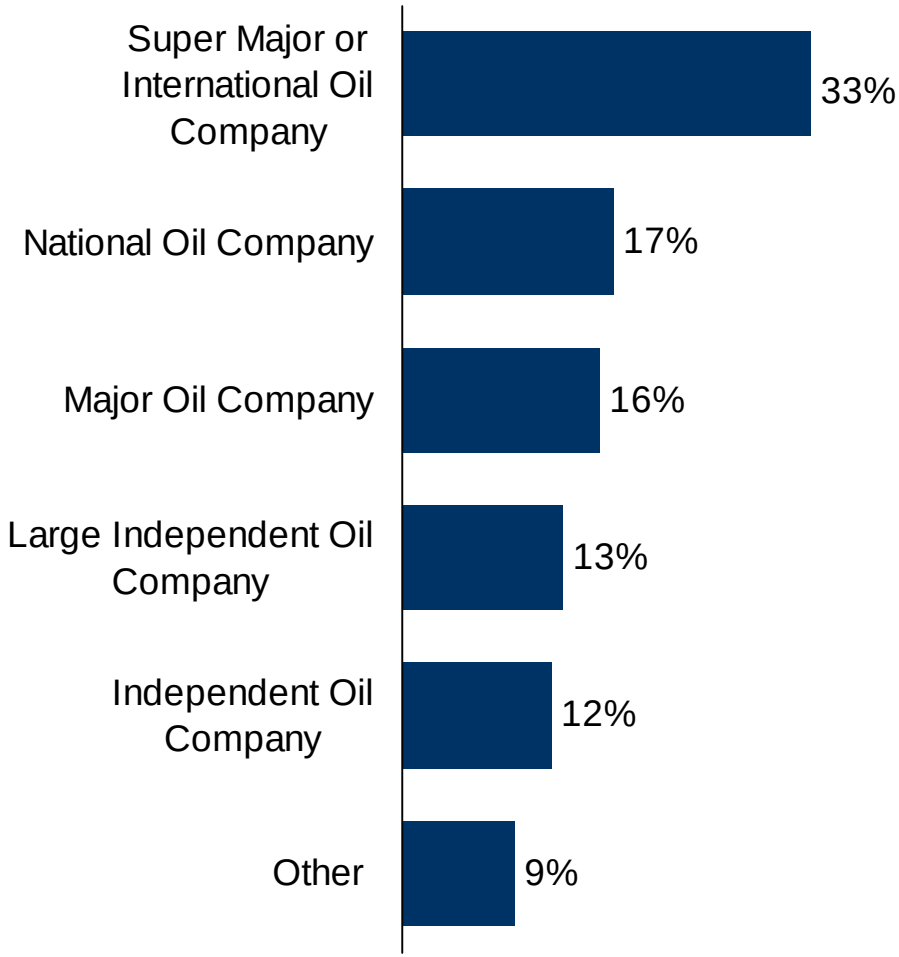
For what type of company do you work?



n = 104

Oil and gas company type

Which category best describes your company?

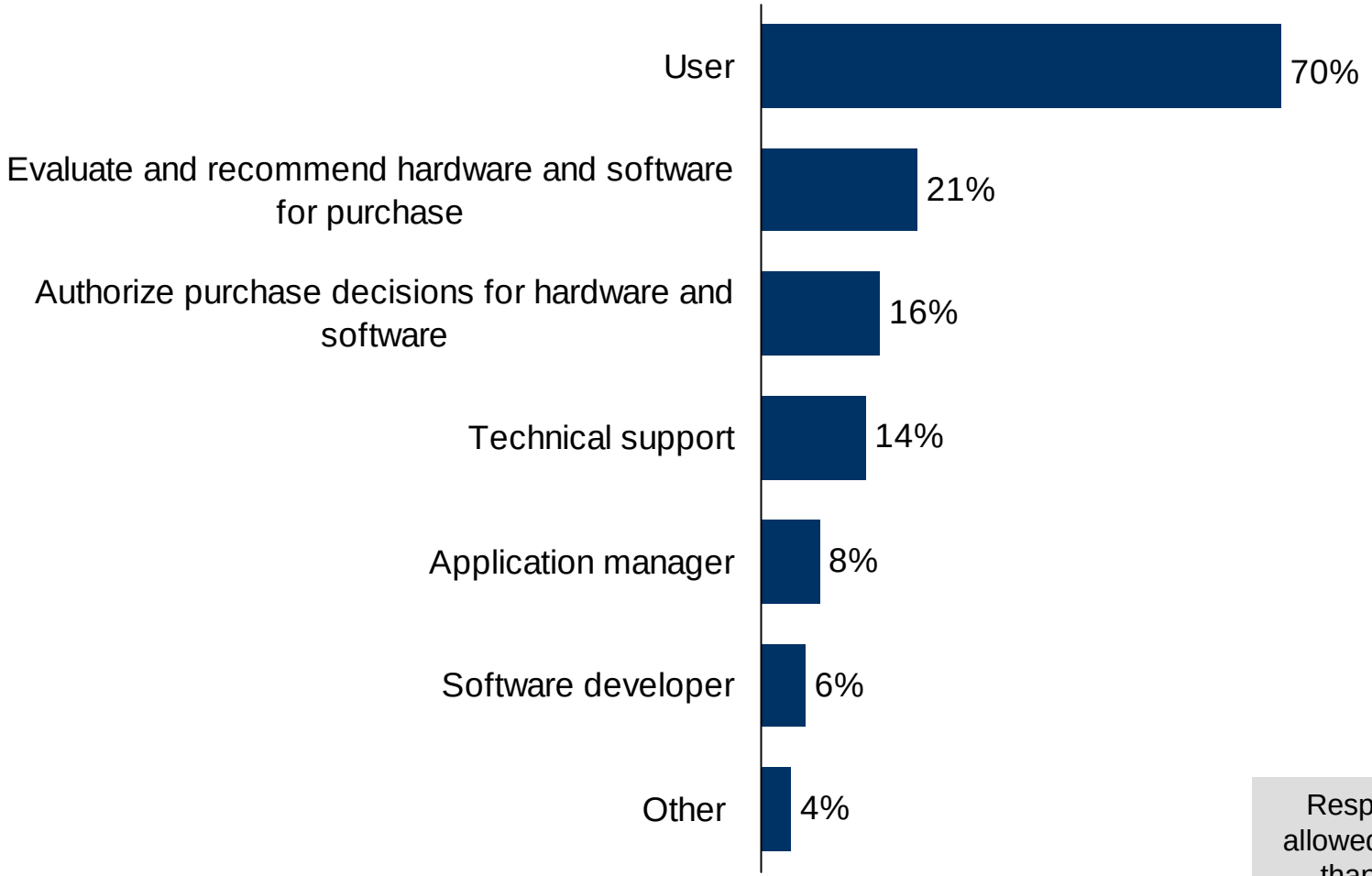


n = 69

Question only asked of those selecting oil and gas company in the previous question

Technical computing involvement

Which of the following best describes your involvement with the technical computing at your company? (Select all that apply)

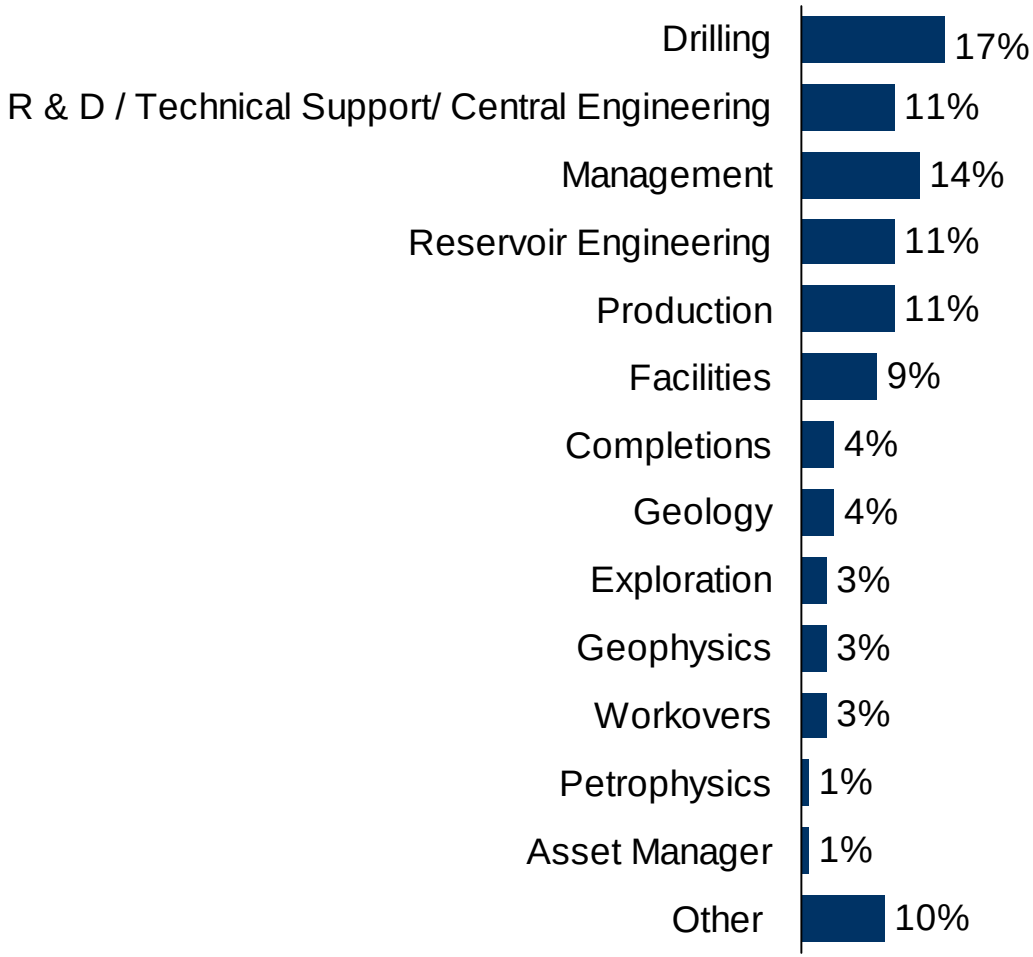


n = 104

Respondents were allowed to select more than one answer

Primary job function

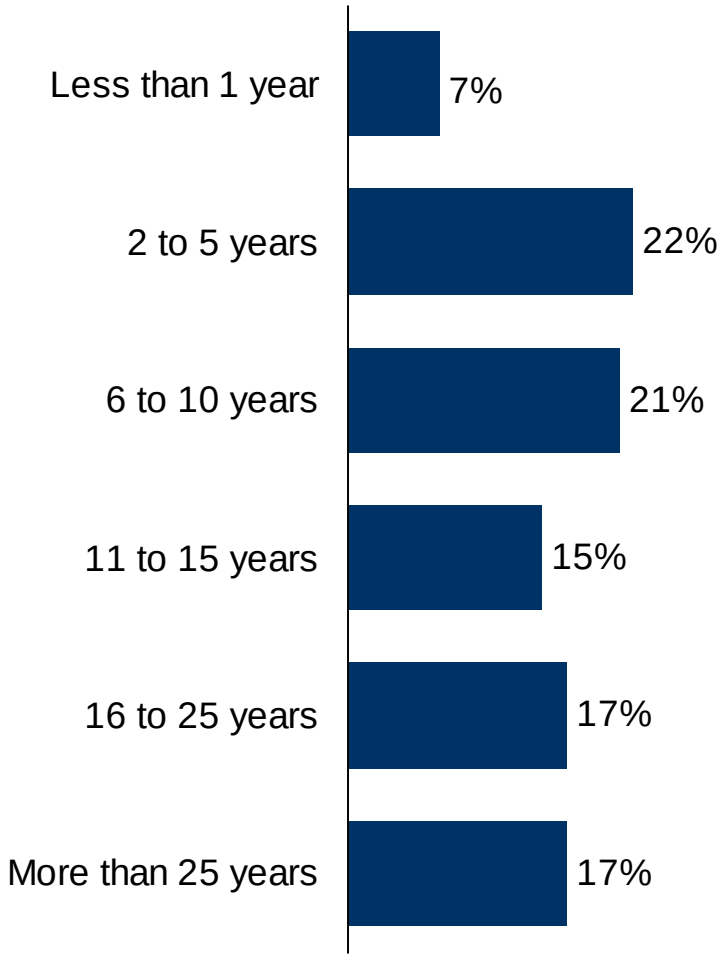
Which of the following best describes your primary job function?



n = 75

Experience in the oil and gas industry

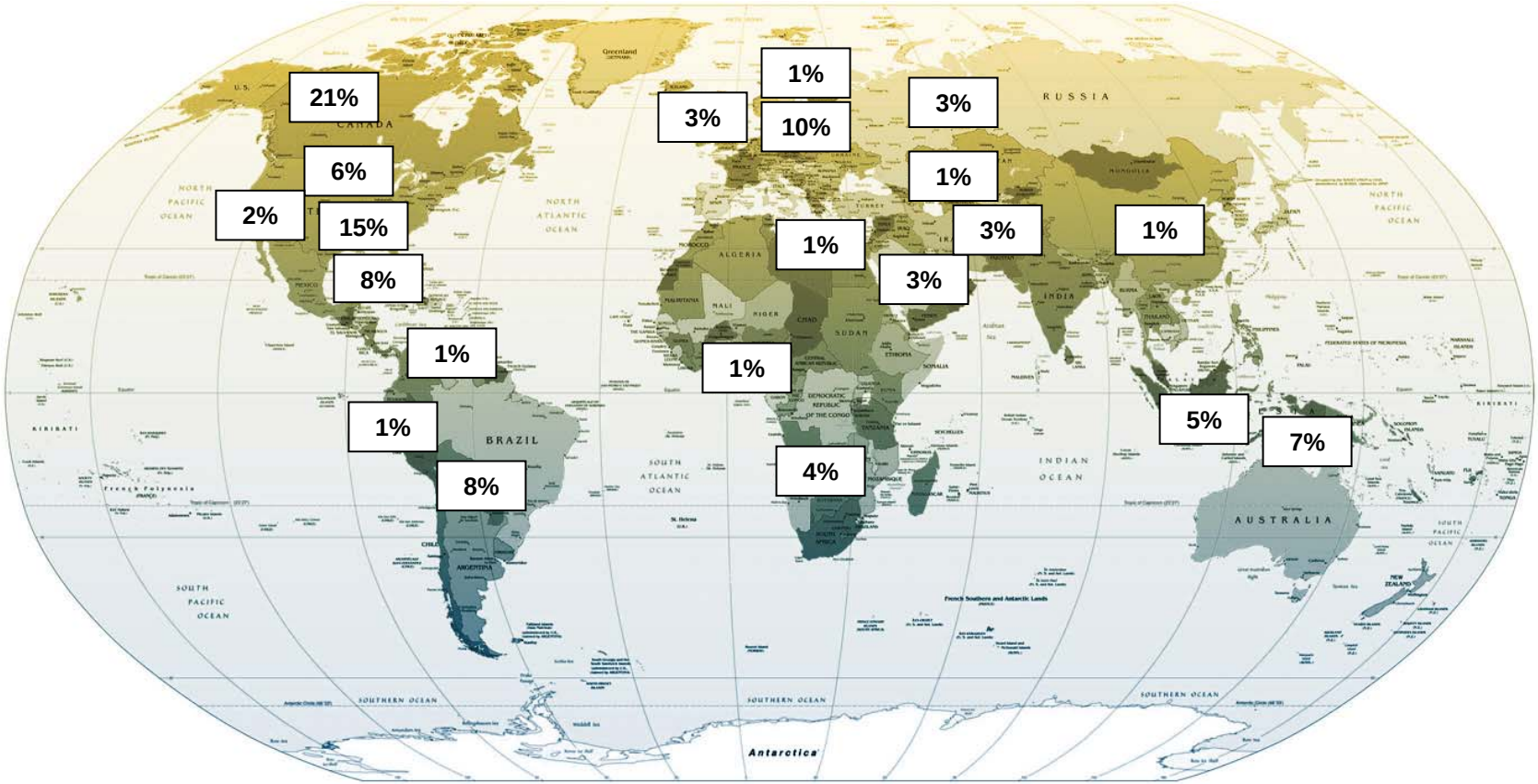
How many years of experience do you have in the oil and gas industry?



n = 104

Office location

Please select your office location. (Select one)



n = 103