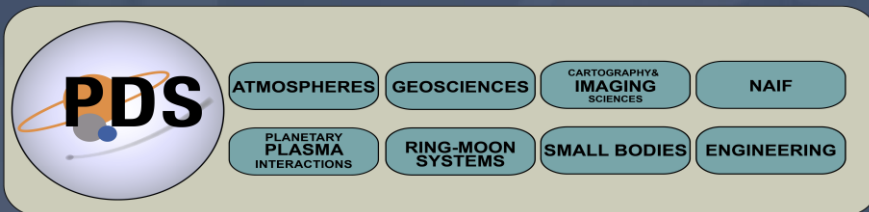# NASA Planetary Data System
Initial User Satisfaction Study

July 2020
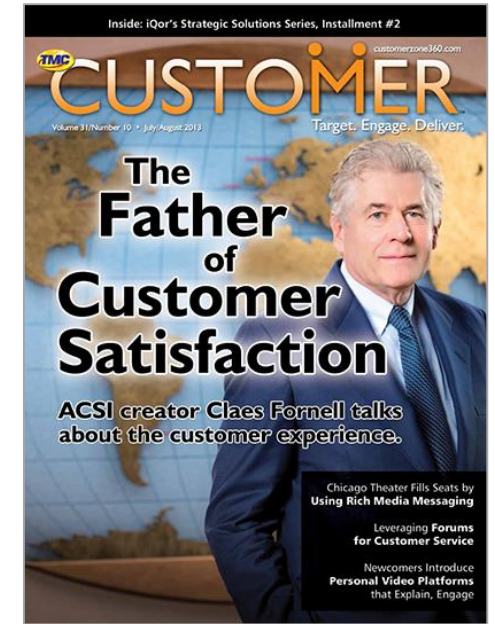
History of CFI Group

- CFI Group: Founded in 1988

- Founding partner of the ACSI*

- Cause and effect methodology / predictive analytics

- Professional services project leads have 20+ years experience

- Serving a global list of clients from 5 offices across 3 continents

- Providing "actionable" customer feedback insights based on the science of the ACSI

**CFI GROUP
WORLDWIDE**
USA – Ann Arbor, MI
(corporate headquarters)
UK – London
ITALY – Milan
CHINA – Shanghai
SWEDEN – Stockholm

Contents

- Study Overview
- Executive Summary
- Satisfaction Model
- Respondent Demographics
- Modeled Satisfaction Drivers
- Non-modeled Satisfaction Drivers
- Appendix

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Introduction

This report documents the findings from the initial NASA Planetary Data System 2020 User Satisfaction Survey. NASA PDS commissioned CFI Group to conduct the study using the methodology of the American Customer Satisfaction Index (ACSI). This was baseline measurement of satisfaction with the NASA Planetary Data System.

The ACSI is a national indicator of customer evaluations of the quality of goods and services available in the U.S. It is the only uniform, cross-industry/government measure of customer satisfaction. The ACSI is widely used to measure customer satisfaction among government programs. This methodology has measured hundreds of programs of federal government agencies since 1999, allowing for benchmarking between the public and private sectors and provides information unique to each agency on how its activities that interface with the public affect the satisfaction of customers. The effects of satisfaction are estimated, in turn, on specific objectives (such as likelihood to use PDS services again).

Although the survey was based on the existing NASA EOSDIS user survey, the questionnaire was developed through a collaborative effort between CFI Group and NASA PDS staff to measure overall user satisfaction and performance of the key aspects of their PDS experience.

This report was produced by CFI Group. If you have any questions regarding this report, please contact CFI Group at 734-930-9090.

Study Overview

Background

- CFI Group has a long-established relationship with the Federal Government and has assisted many agencies and departments with their customer and employee satisfaction measurement programs. NASA EOSDIS and CFI Group have partnered on many satisfaction measurements since 2013. This was the first project for PDS.

- The objective of the NASA PDS user study was to gather feedback from users on their experiences working with both PDS as a whole, as well as specific Nodes of study. This survey is part of the NASA PDS commitment to continuous quality improvement to achieve organizational excellence and will assist leadership in making data-driven decisions on where to invest in improvement initiatives that will have the greatest affect on user satisfaction.

Survey Administration

- Data was collected via two methods:
  - Know users were sent email invitations with a secure online survey link embedded.
  - The PDS website included an anonymous survey link that could be accessed by anyone who visited the PDS website

- Data was collected from March 10, 2020 to June 5, 2020. There were 198 total responses.

The ACSI Approach

- CFI Group's methodology is based on the approach used in the American Customer Satisfaction Index (ACSI). The ACSI methodology provides:

  › A precise and granular view into the customer experience.

  › Guidance about which areas of improvement will produce the greatest increases in user satisfaction.

- The key metric of this survey is the Customer Satisfaction Index (CSI) score.

- The CSI is the weighted average of three questions that ask directly about customer satisfaction.

  › Using a scale from 1 to 10, where 1 means Very Dissatisfied and 10 means Very Satisfied, rate your overall satisfaction.

  › Using a scale from 1 to 10, where 1 means Falls Short of Your Expectations and 10 means Exceeds Your Expectations, how well does your experience meet your expectations?

  › Using a scale from 1 to 10, where 1 means Not Very Close to the Ideal and 10 means Very Close to the Ideal, how close was your experience to your "ideal" experience?

- This average is converted from the survey's 1 to 10-point scale to a 0 to 100-point score for reporting purposes.

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Definitions

- Customer Satisfaction Index (CSI)
    - › The CSI is the weighted average of three questions that ask directly about customer satisfaction.
        - › Thinking about the Benefits.gov website, using a scale where 1 means "Very dissatisfied" and 10 means "Very satisfied", how satisfied are you with PDS overall?
        - › Think about your expectations for this website. Using a scale where 1 means "Falls short of your expectations" and 10 means "Exceeds your expectations", how does PDS compare to your expectations?
        - › Now imagine an ideal website. Using a scale where 1 means "Not very close to the ideal" and 10 means "Very close to the ideal", how does PDS compare to this ideal?

- Drivers (of Satisfaction)
    - › The aspects of the customer experience are measured in the survey by a series of rated questions. Drivers for this study include:
        - › PDS Search
        - › Format

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2 Executive Summary

Key Findings, Implications and Recommendations

- The initial customer satisfaction score (CSI) for NASA Planetary Data System (PDS) users is 66. This is just below the overall Federal Government aggregated score.

  - The overall satisfaction score for PDS was 71, while satisfaction compared to expectations (64) and satisfaction compared to ideal (61) were noticeably lower. This indicates a difference between expectations and actual experience. Anything that can align expectations and experience should improve overall satisfaction.

  - Users are likely to recommend PDS to others (82) and are extremely likely to use PDS services again in the future (91).

  - Users from the United States made up the majority of respondents (71%) and tended to score lower on the satisfaction metrics than respondents from other parts of the world.

- Most users considered themselves as a 'Planetary science researcher'. Only ten percent of respondents were classified as a 'Student'.

- Although two-thirds of respondents indicated they needed to know the archive node to access data, most were able to find what they were looking for.

  - Respondents used multiple methods to search for data. 'Manually searching', 'Google', and 'pds.gov search services' were used by roughly half of the respondents.

- Users were extremely pleased with all aspects of customer service. They found customer service to be 'Professional', 'Knowledgeable', and 'Helpful'.

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3 Satisfaction Model

Customer Satisfaction Model

- **Attribute scores** are the mean (average) respondent scores to each individual question that was asked in the survey. Respondents are asked to rate each item on a 1-to-10 scale with "1" being "poor" and "10" being "excellent." CFI Group converts the mean responses to these items to a 0-to-100 scale for reporting purposes. It is important to note that these scores are averages, not percentages. The score is best thought of as an index, with "0" meaning "poor" and "100" meaning "excellent."

- A **component score** is the weighted average of the individual attribute ratings given by each respondent to the questions presented in the survey. A score is a relative measure of performance for a component, as given for a particular set of respondents. In the model (shown on Slide 15), the component score for PDS Search is an index of the ratings of two questions (Overall experience with PDS Web Services/Interfaces and Overall experience with search methods).

- **Impacts** represent the effect on the subsequent component if the initial driver (component) were to be improved or decreased by five points. For example, if the score for PDS Search increased by five points (66 to 71), the CSI score would increase by the amount of its impact, 2.3 points, (from 66 to 68.3). If the driver increases by less than or more than five points, the resulting change in satisfaction would be the corresponding fraction of the original impact. Impacts are additive; if multiple areas were to each improve by five points, the related improvement in satisfaction will be the sum of the impacts.

- As with scores, impacts are also relative to one another. A low impact does not mean a component is unimportant. Rather, it means that a five-point change in that one component is unlikely to result in much improvement in satisfaction at this time. Therefore, components with higher impacts are generally recommended for improvement first, especially if scores are lower for those components.

Definitions – Scores and Impacts

- Question Score:
  - Average customer score for questions asked in the survey
  - Questions are asked on 1-10 scale, translated to 0-100

- Driver Score:
  - Weighted average of Questions that make up a Driver
  - Scores range from 0 to 100
  - Scores are reported as means, not percentages

- Driver Impact:
  - Driver impacts show you the rise in Satisfaction you can expect for every 5-point increase(or fraction thereof) in the associated Driver score.
  - Help you understand where improvement matters most to your customers.

- Future Behavior Impact:
  - This number shows you the expected increase in the Future Behavior score for every 5-point increase (or fraction thereof) in the Satisfaction score.

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Interpreting Results

A Note About Scores

CFI Group recommends that scores be viewed on a continuum and each agency use the results to identify strengths and areas of opportunity. To answer the question about how to interpret the strength of a particular score, one can use the below guideline.

- Exceptional: 90-100
- Excellent: 80-89
- Good: 70-79
- Average: 60-69
- Below Average: Less than 60

The overall average Customer Satisfaction Index for the Federal Government is 68.

PDS User Satisfaction Model

Satisfaction Drivers

66	2.3	PDS Search
65	1.7	Format

CSI

66

Overall Satisfaction: 71
Compared to Expectations: 64
Compared to Ideal: 61
n = 198
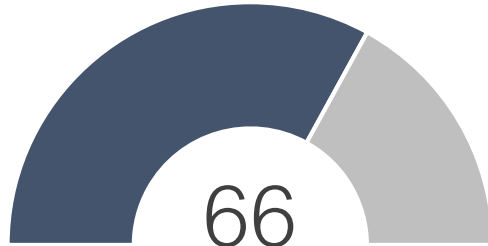
Future Behaviors

Recommend	4.3	82
Future Use	2.4	91

■ Scores represent your performance as rated by customers.

■ Impacts show you which driver has the most/least leverage – where improvements matter most/least to your customers

NASA PDS Priority Matrix

- Drivers in the Top Priority quadrant have a high impact on CSI and a relatively low score. These are the drivers where the organization can achieve significant improvements and see positive changes in customer satisfaction.

- Strengths are high impact drivers that also have high scores. There is less room for improvement with these drivers than the Top Priorities, however, these drivers have high impact on satisfaction.

- Maintain identifies high-scoring drivers that do not have high impact on customer satisfaction. Maintaining the already high scores for these drivers is important.

- Secondary Opportunities are drivers that have low impact on satisfaction and are relatively low scoring.
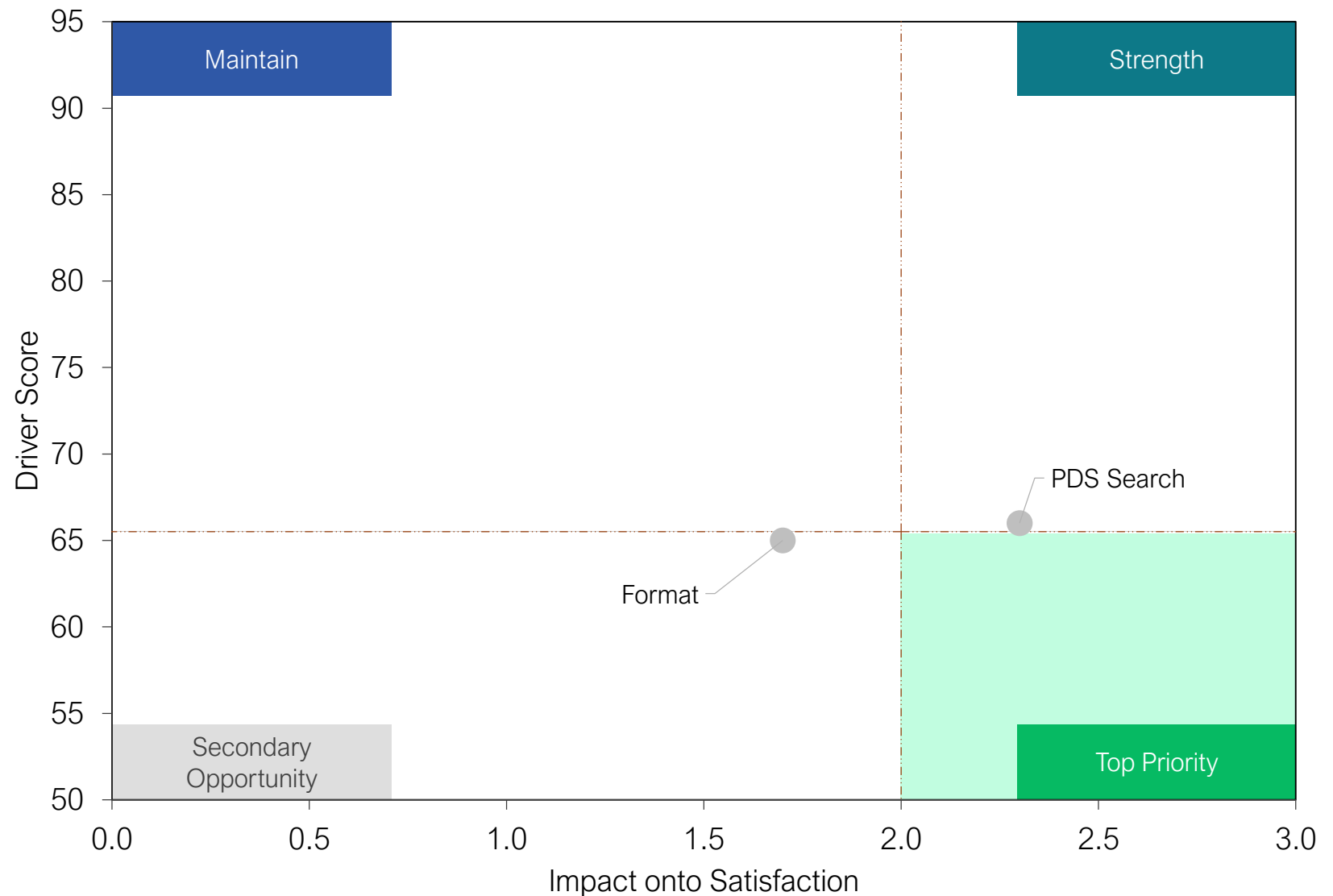
User Satisfaction and Future Behaviors

Bar chart values:
- Customer Satisfaction Index: 66
- Overall satisfaction: 71
- Compared to expectations: 64
- Compared to ideal: 61
- Recommend: 82
- Future Use: 91

- The satisfaction scores for both Compared to Expectations and Compared to Ideal are lower than the score for Overall Satisfaction. This indicates, that although users are relatively satisfied, they have higher expectations.

- Anything that would better align expectations and the actual experience should increase the CSI.

- Recommend and Future Use scores are much higher than CSI.

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United States vs Rest of the World Satisfaction

Customer Satisfaction Index
- USA: 64 ▲
- Rest of World: 71

Overall satisfaction
- USA: 70
- Rest of World: 74

Compared to expectations
- USA: 61
- Rest of World: 71 ▲

Compared to ideal
- USA: 58
- Rest of World: 68 ▲

Recommend
- USA: 81
- Rest of World: 87

Future Use
- USA: 91
- Rest of World: 91
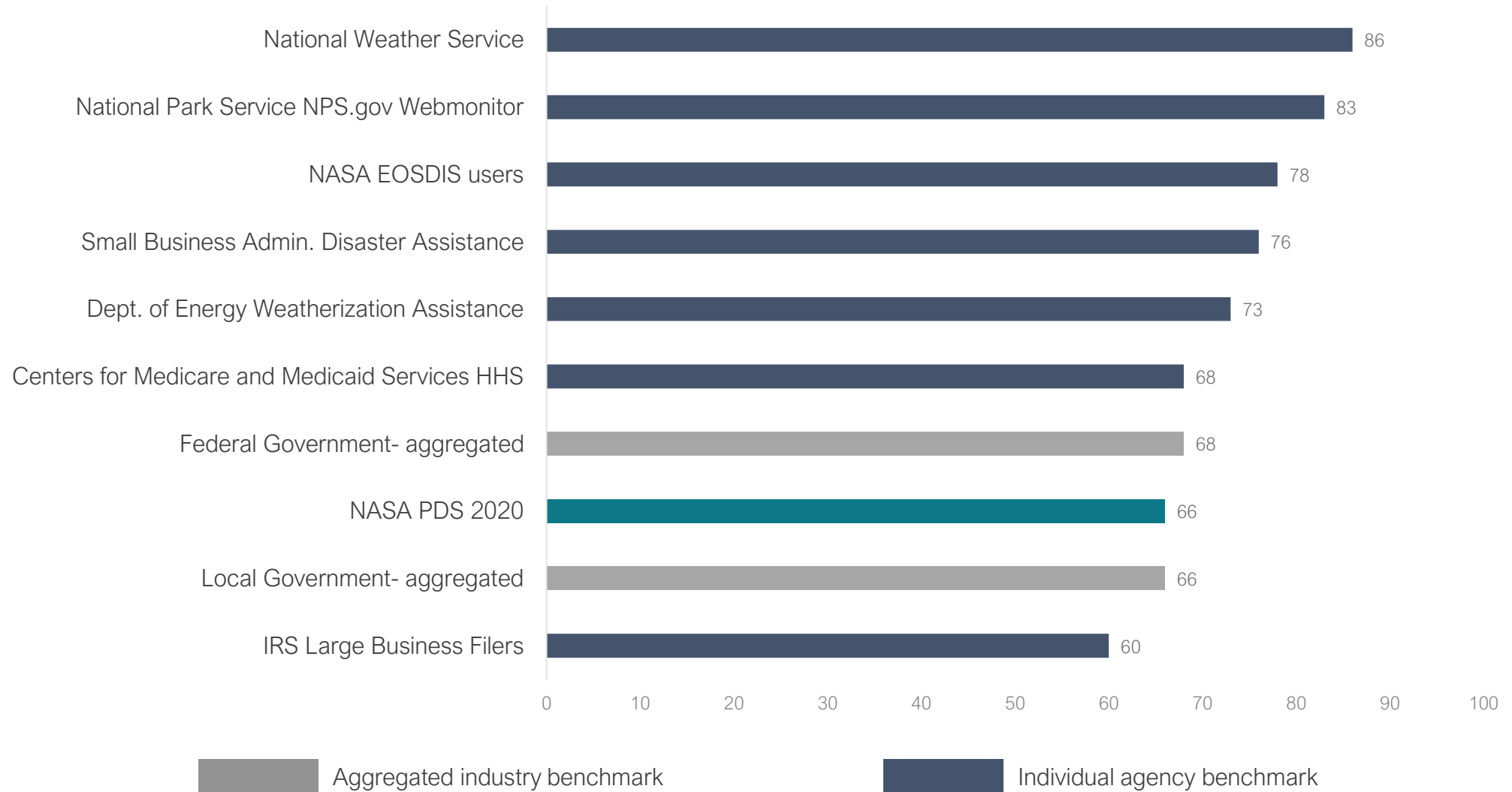
■ USA ■ Rest of World
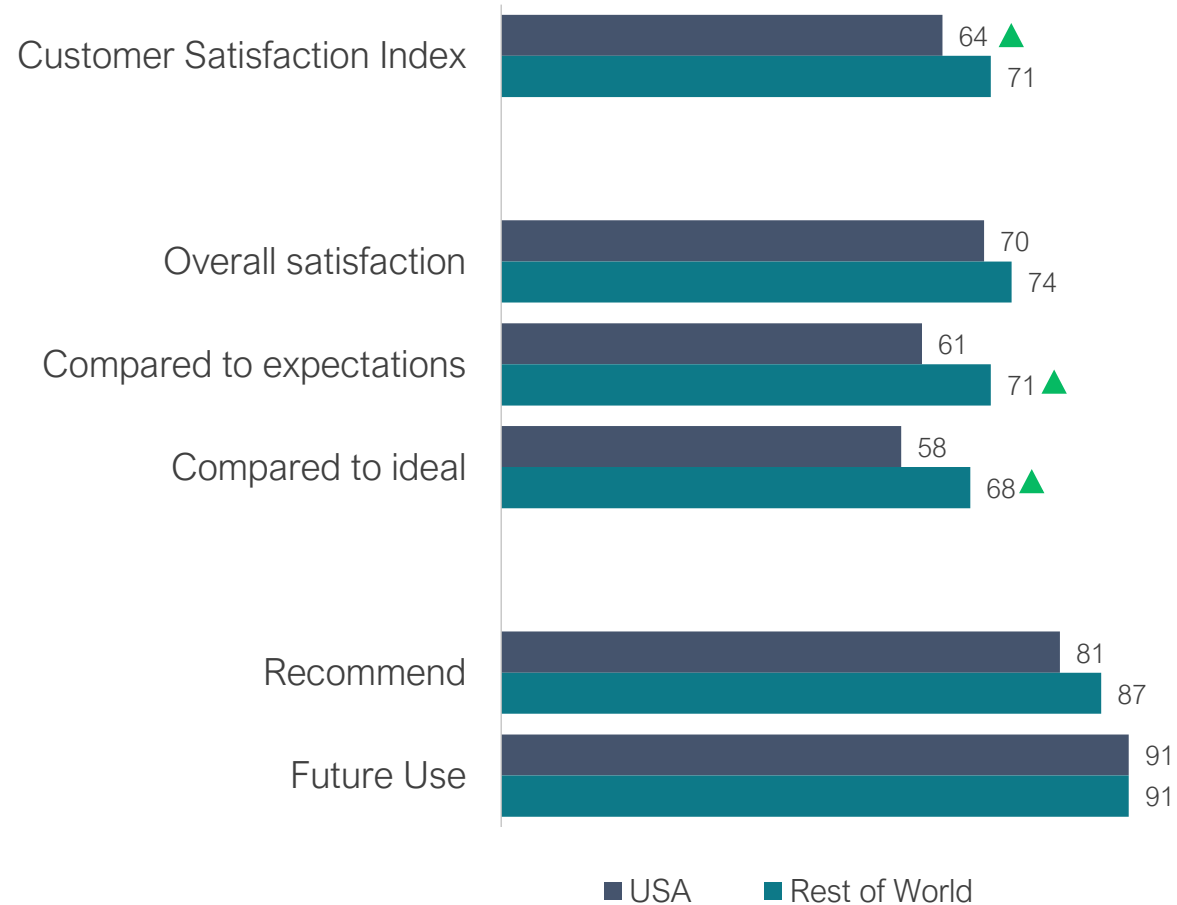
▲▼ *Indicates change is significant at 90% confidence*

- ▪ The United States accounted for 71% of all responses. France and Spain were next with 5% each.

- ▪ American respondents tended to post lower satisfaction scores across the board with a large difference occurring in the Expectations and Ideal scores.

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NASA compares favorably to aggregated government scores

	Score
National Weather Service	86
National Park Service NPS.gov Webmonitor	83
NASA EOSDIS users	78
Small Business Admin. Disaster Assistance	76
Dept. of Energy Weatherization Assistance	73
Centers for Medicare and Medicaid Services HHS	68
Federal Government- aggregated	68
NASA PDS 2020	66
Local Government- aggregated	66
IRS Large Business Filers	60

Aggregated industry benchmark   Individual agency benchmark

Benchmarks are from https://www.theacsi.org/the-american-customer-satisfaction-index
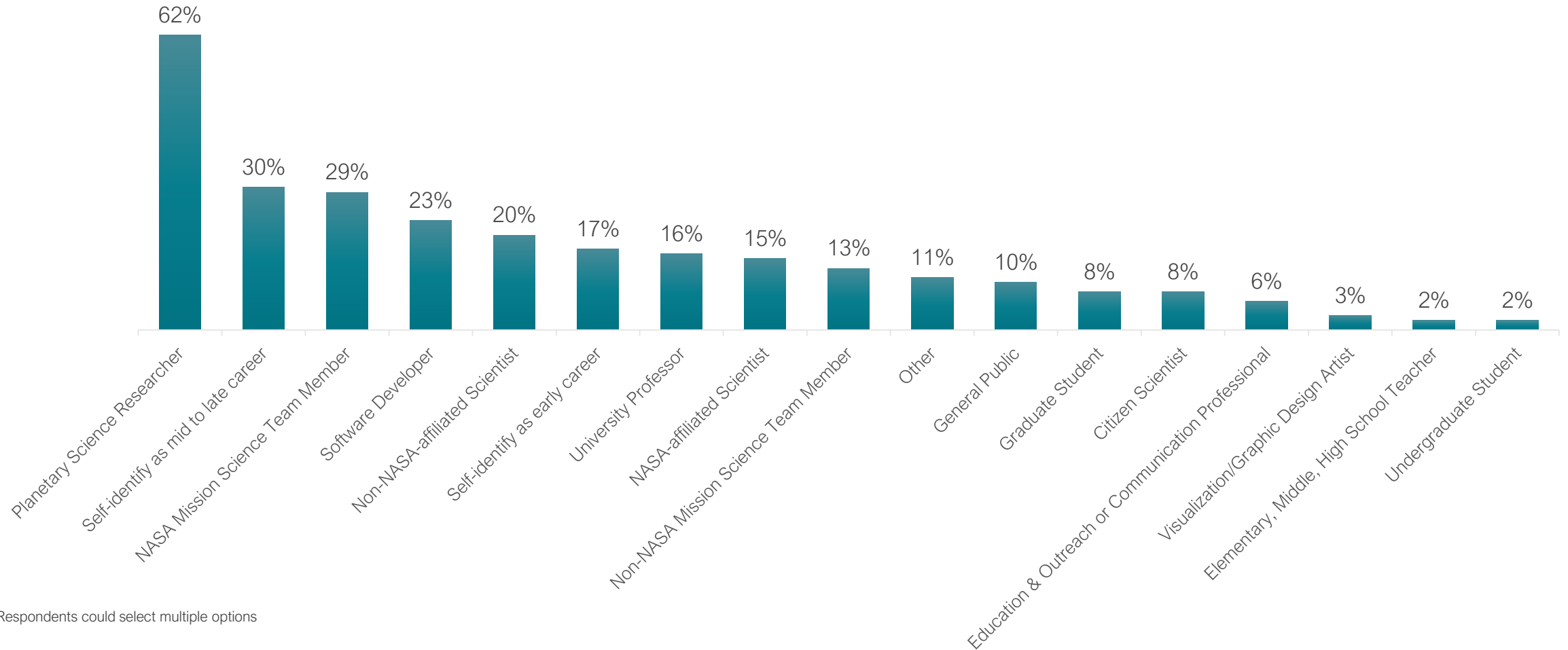
4 Respondent Demographics

User Affiliation

- A majority of users regarded themselves as a "Planetary Science Researcher"

Respondents could select multiple options

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User Type

- Almost all respondents were "Data User" with a majority (86%) having at least "Moderate Experience."

User Category

91% — Data User
51% — Data Provider
32% — Reviewer of PDS data
6% — Other

Respondents could select multiple options

Experience Level

Expert, 15%
Moderate to extensive experience 36%
Little experience 14%
Moderate experience, 35%

■ Moderate to extensive experience ■ Moderate experience ■ Little experience ■ Expert

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22
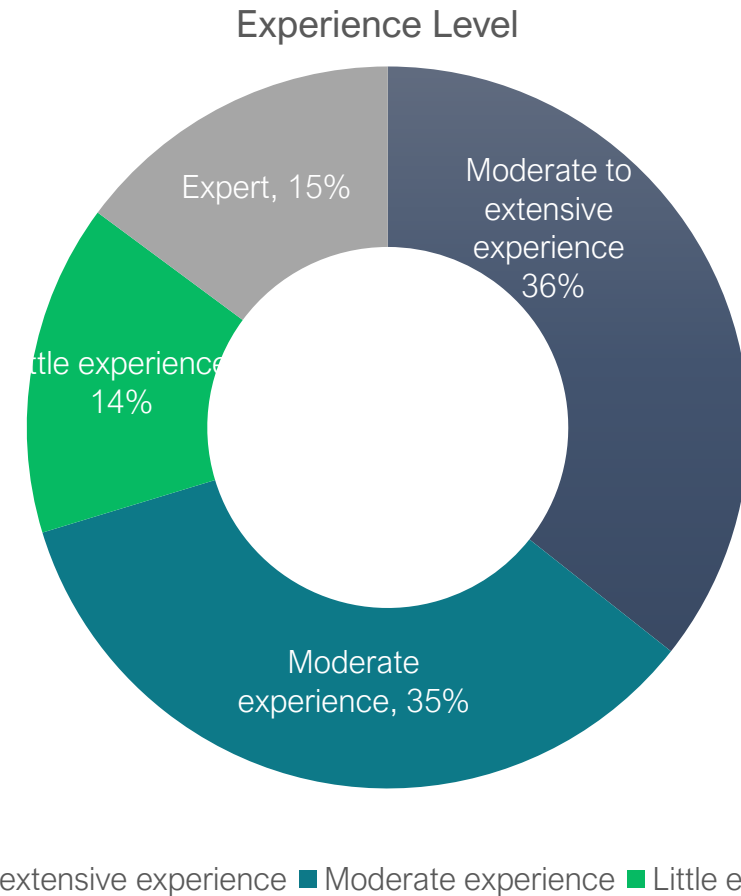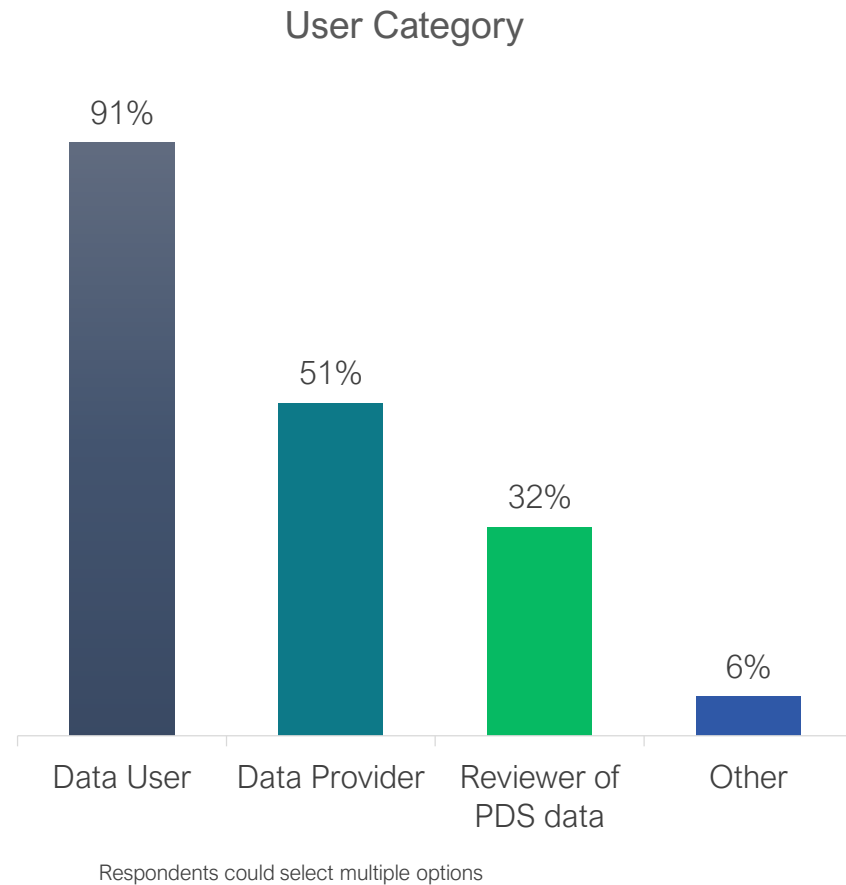
Nodes Used

- Two-thirds of respondents indicated they needed to know the archive node to access data.

- Planetary Surfaces was the most popular research area.

Research areas or disciplines use PDS science data or services ~~

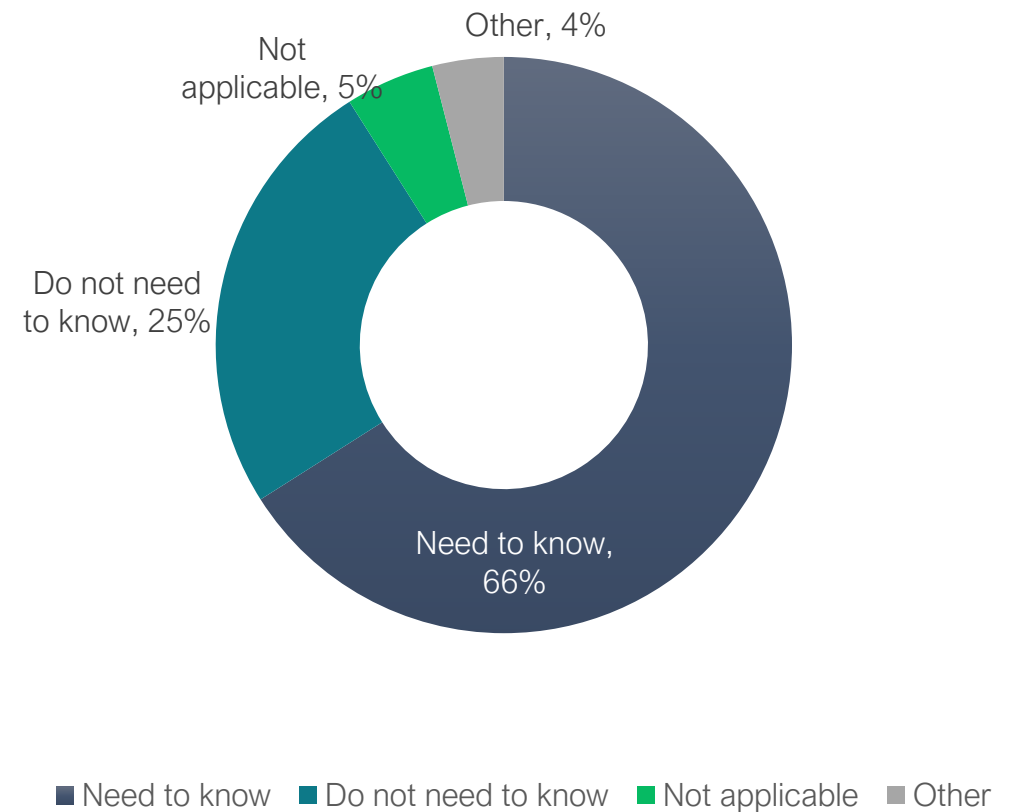| Research area	Percentage
Planetary surfaces including geology and geophysics	66%
The Earth's Moon	34%
Asteroids including NEOs	31%
Planetary atmospheres and exospheres	28%
Orbits and Astrometry	24%
Comets	22%
Planetary rings	16%
Planetary magnetospheres, ionospheres, and plasmas	10%
Space geodesy	9%
Other	9%
Planetary interiors	8%
Planetary system dynamics and formation	7%
Satellite atmospheres and exospheres	6%
Exobiology	4%
Exoplanets	4%
Oceans	2%

Respondents could select multiple options

Need to know which node archived data in order to access data

- Need to know, 66%
- Do not need to know, 25%
- Not applicable, 5%
- Other, 4%

Legend: Need to know · Do not need to know · Not applicable · Other

Search Tools

- 'Manually searching the archives', 'Google', and the 'Search feature on pds.nasa.gov' were the most popular search tools to find data.

Search services and tools used ~~

| Tool	Percentage
Search by manually browsing the archives	55%
Google	48%
Search services on pds.nasa.gov	45%
Planetary Image Atlas	32%
Analyst's Notebook (AN)	29%
Orbital Data Explorer (ODE)	28%
Photojournal	24%
Cartography and Imaging Sciences Node Annex	20%
Planetary Image Locator Tool (PILOT)	18%
Outer Planets Unified Search (OPUS)	16%
Search/queries using personal/institutional scripts	16%
Small Bodies Data Ferret	10%
Other	10%
Small Body Mapping Tool	9%
Digit	2%
Used a PDS search service/tool but do not know the name	2%

Respondents could select multiple options

Search Tools (cont)

- Around half of respondents needed to search more than one node but most (93%) were able to find what they were looking for.

Frequency of finding what looking for

- 75% to 100% of the time
- 50% to 75% of the time
- 25% to 50% of the time
- 0% to 25% of the time
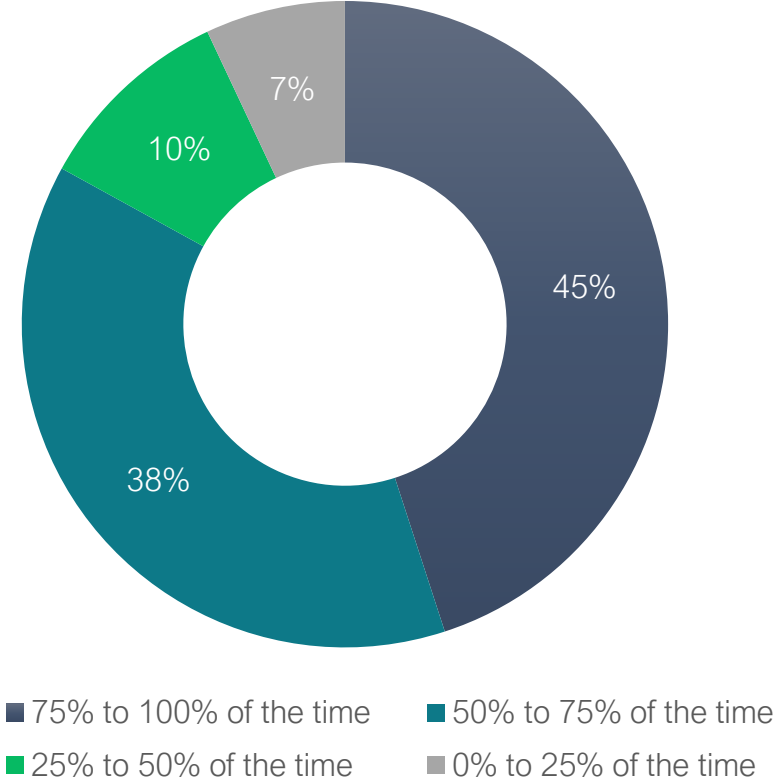
Needed to search more than one node to find all of the data searching for

- Needed to search more than one
- Did not need to search more than one
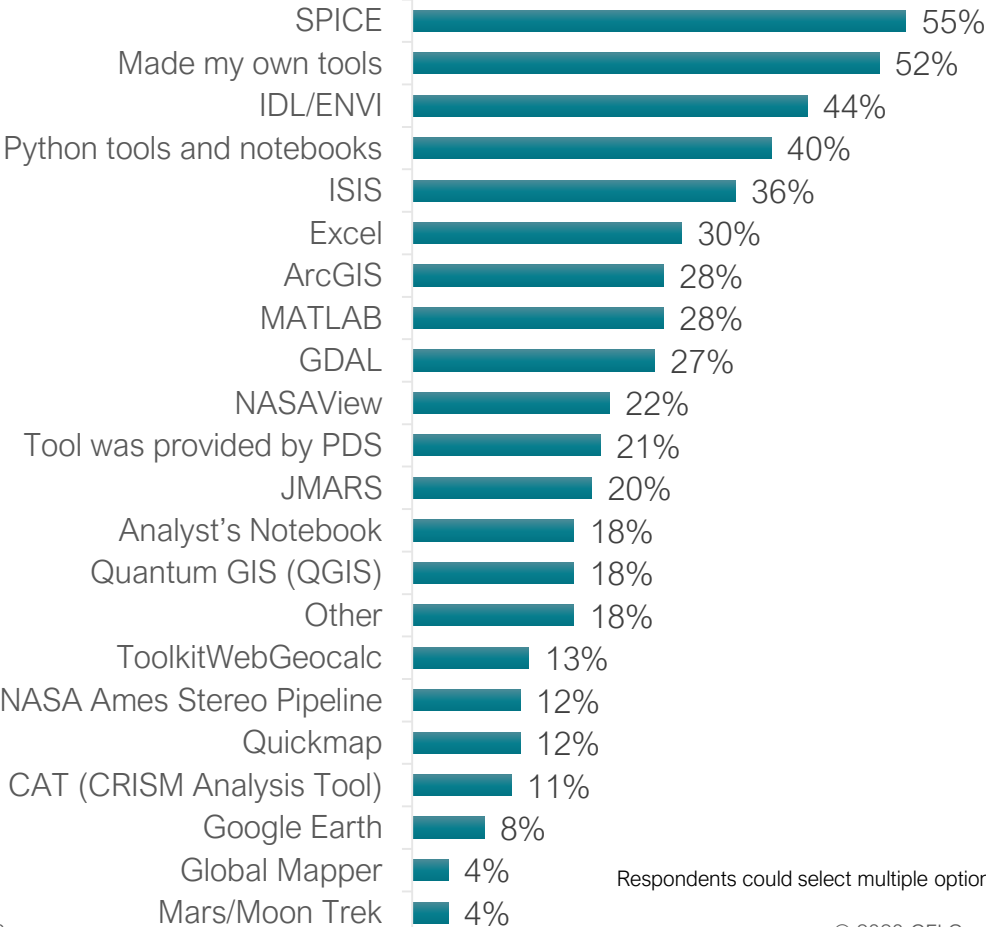- I'm not sure

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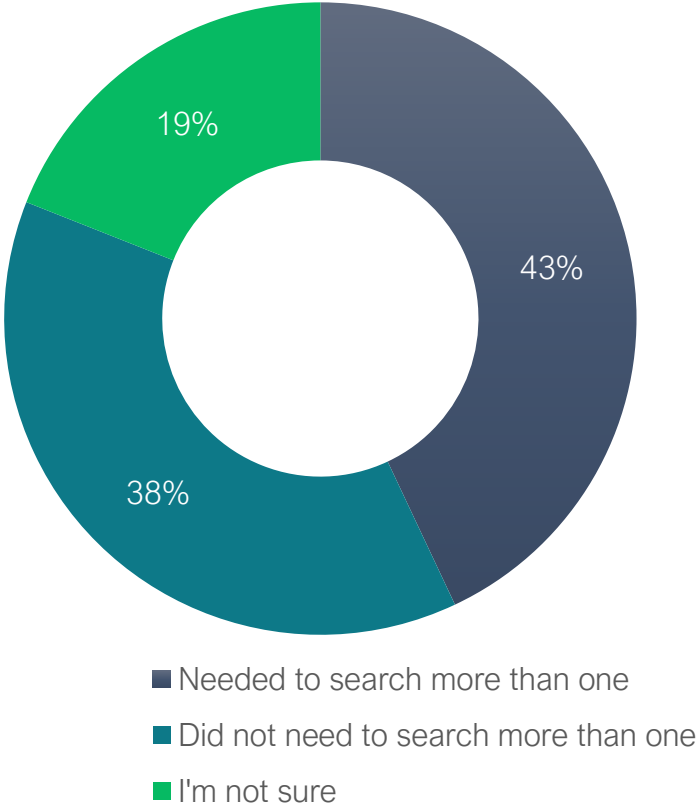
Software Tools

- Most respondents used software tools (84%) to work with the data, with SPICE or custom tools being the most often used.

- Interestingly, 16% reported using no tools at all.

## Used software tools to work with data

16%

84%

■ Used   ■ Did not use
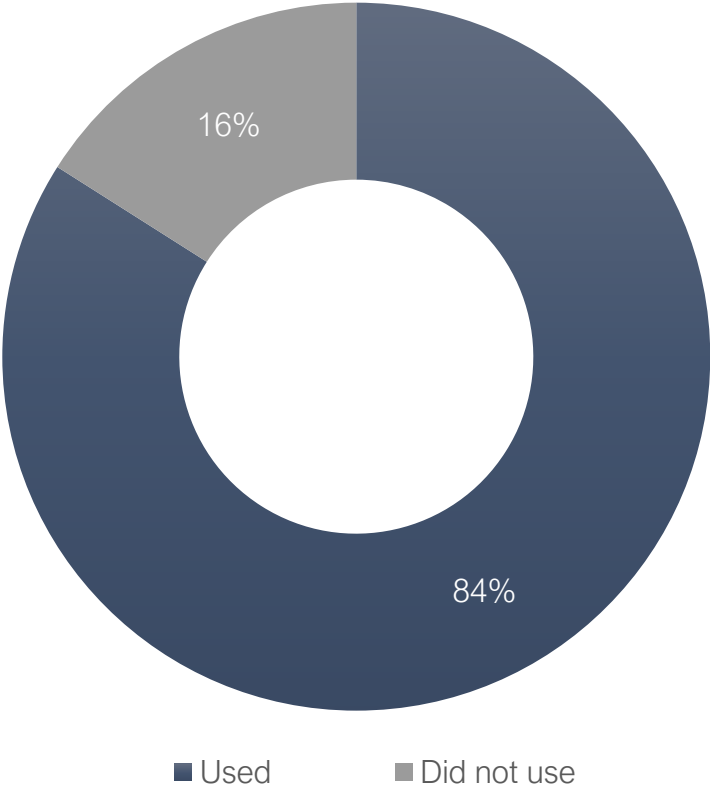
Software tools used with PDS data ~~

Tool	Percent
SPICE	55%
Made my own tools	52%
IDL/ENVI	44%
Python tools and notebooks	40%
ISIS	36%
Excel	30%
ArcGIS	28%
MATLAB	28%
GDAL	27%
NASAView	22%
Tool was provided by PDS	21%
JMARS	20%
Analyst's Notebook	18%
Quantum GIS (QGIS)	18%
Other	18%
ToolkitWebGeocalc	13%
NASA Ames Stereo Pipeline	12%
Quickmap	12%
CAT (CRISM Analysis Tool)	11%
Google Earth	8%
Global Mapper	4%
Mars/Moon Trek	4%

Respondents could select multiple options

R&A Funded Data Providers

Submitted R and A proposal that included archiving data in PDS

- No — 52%
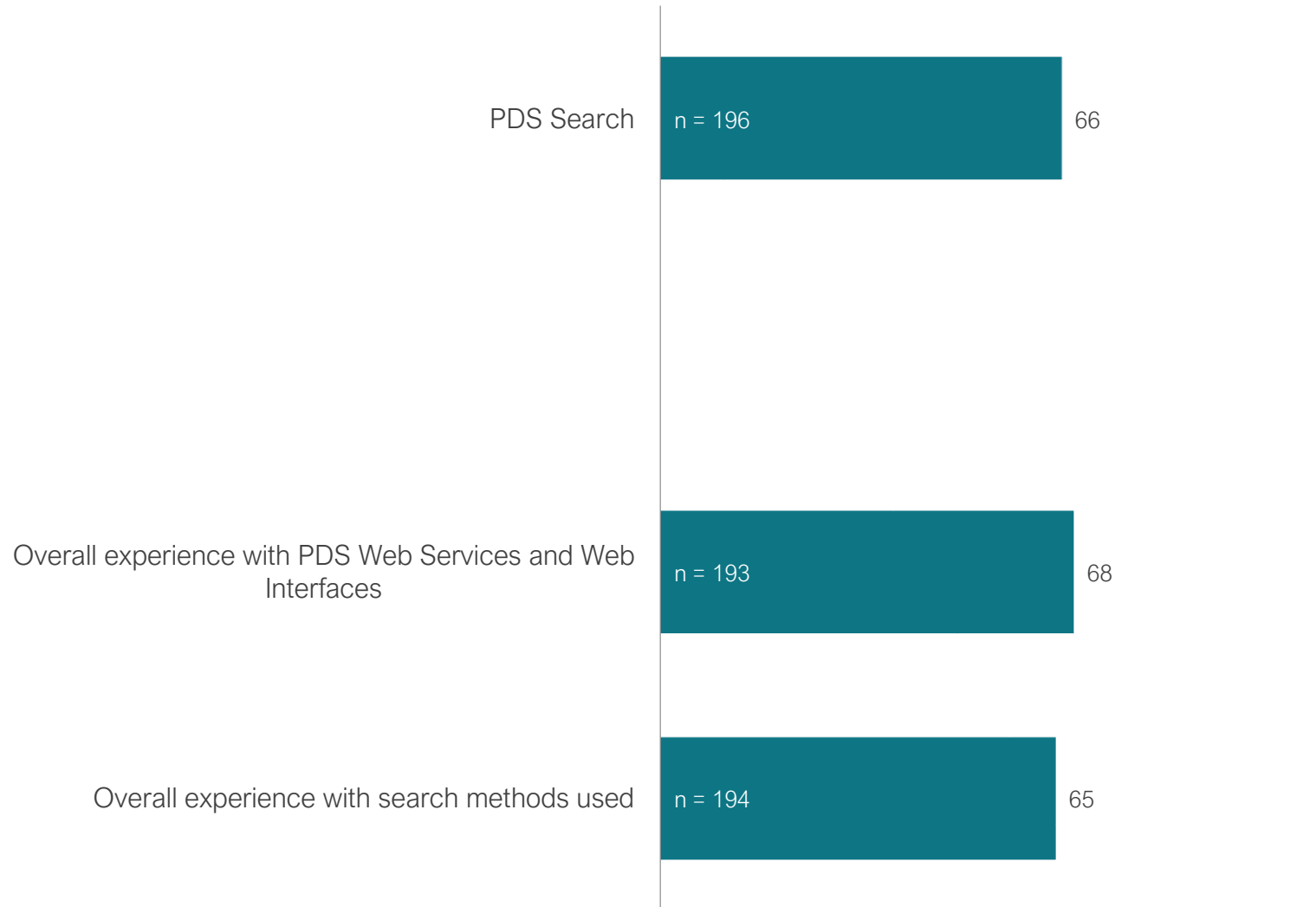- Yes — 33%
- No, but have archived data — 15%
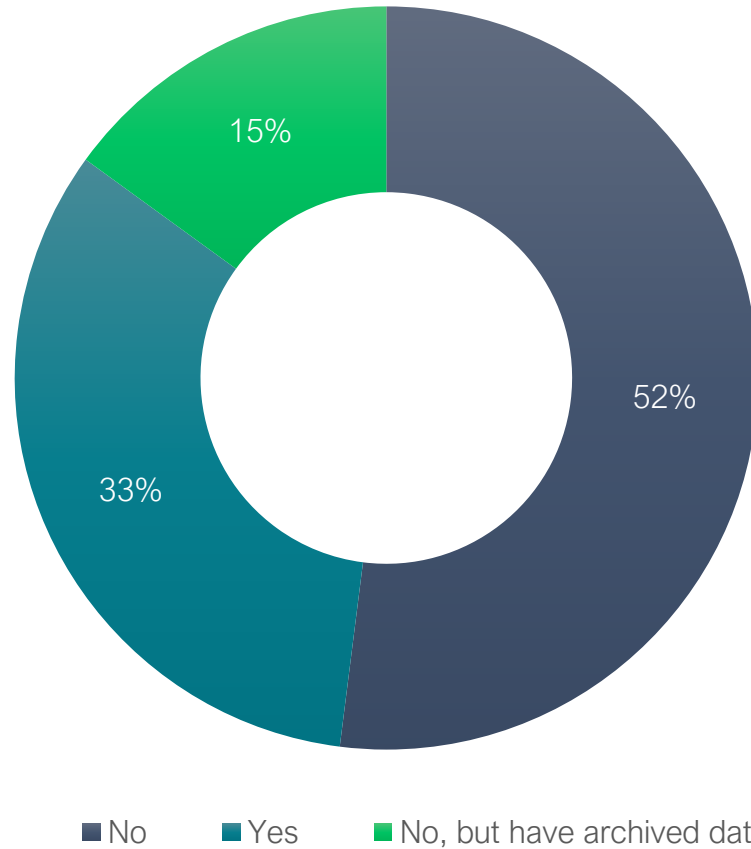
- Roughly half of respondents submitted a R&A proposal.

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5 Modeled Satisfaction Drivers

PDS Search Scores

PDS Search — n = 196 — 66

Overall experience with PDS Web Services and Web Interfaces — n = 193 — 68

Overall experience with search methods used — n = 194 — 65

- While respondents find the search capabilities sufficient, they offer ideas for improvement as echoed by this respondent:

- *"DS is a very important archive, and the current work around PDS4 is very good. The data at PDS are unique (the Solar System exploration is a series of unique observations) and the PDS is therefore essential to the planetary science community. More integrated search tools for interdisciplinary studies (using concepts such as VESPA) would make it even better."*

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Format Scores

Format (aggregate) n = 194 65

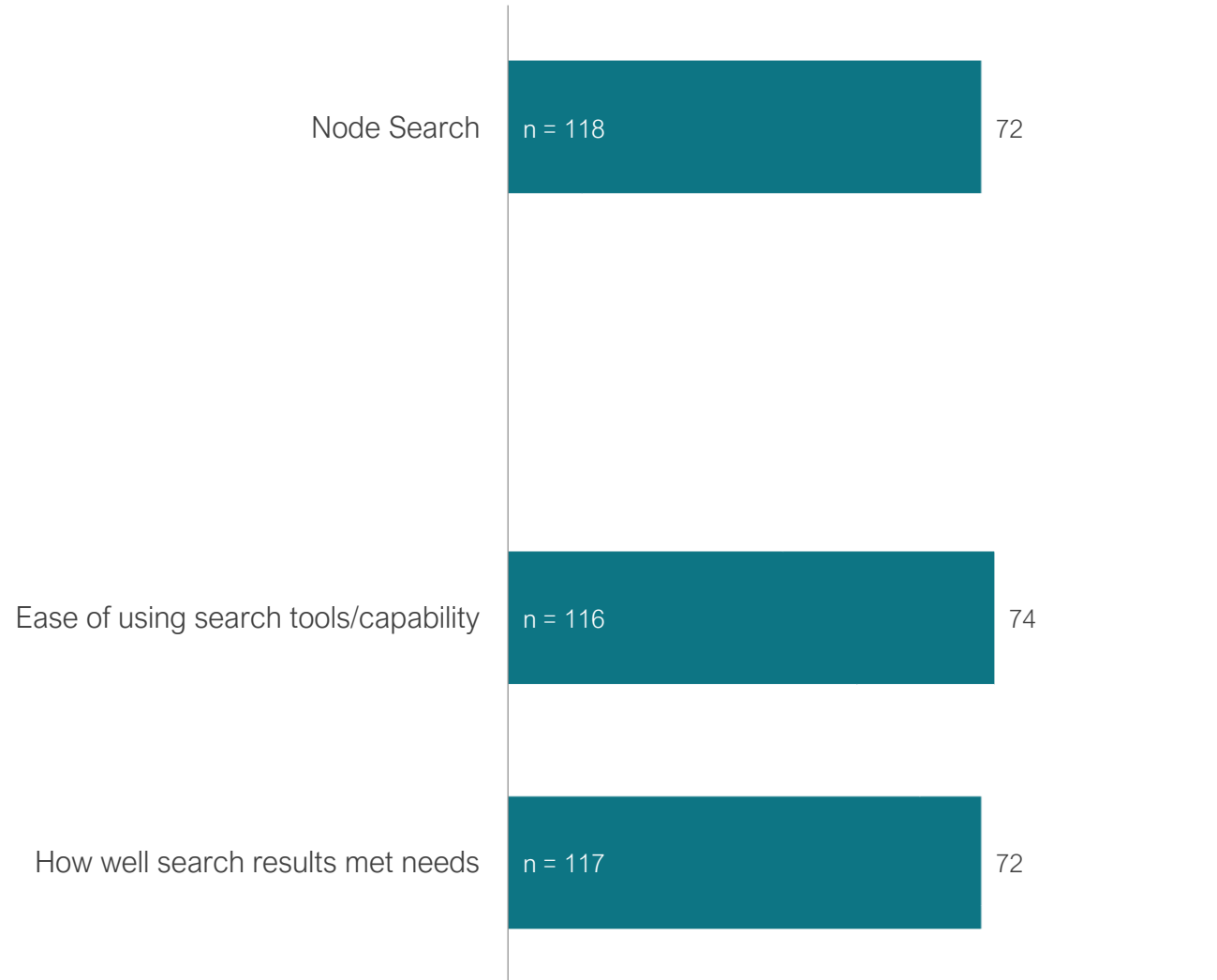Usability of PDS data products in delivered formats n = 194 65

- From user comments, there seemed to be a greater need for documentation on formats:

- *" (I would like to see) some user-friendly documents / presentations on migrating data from PDS3 to PDS4 and (any) additional tools related to the processing of PDS4 format data"*
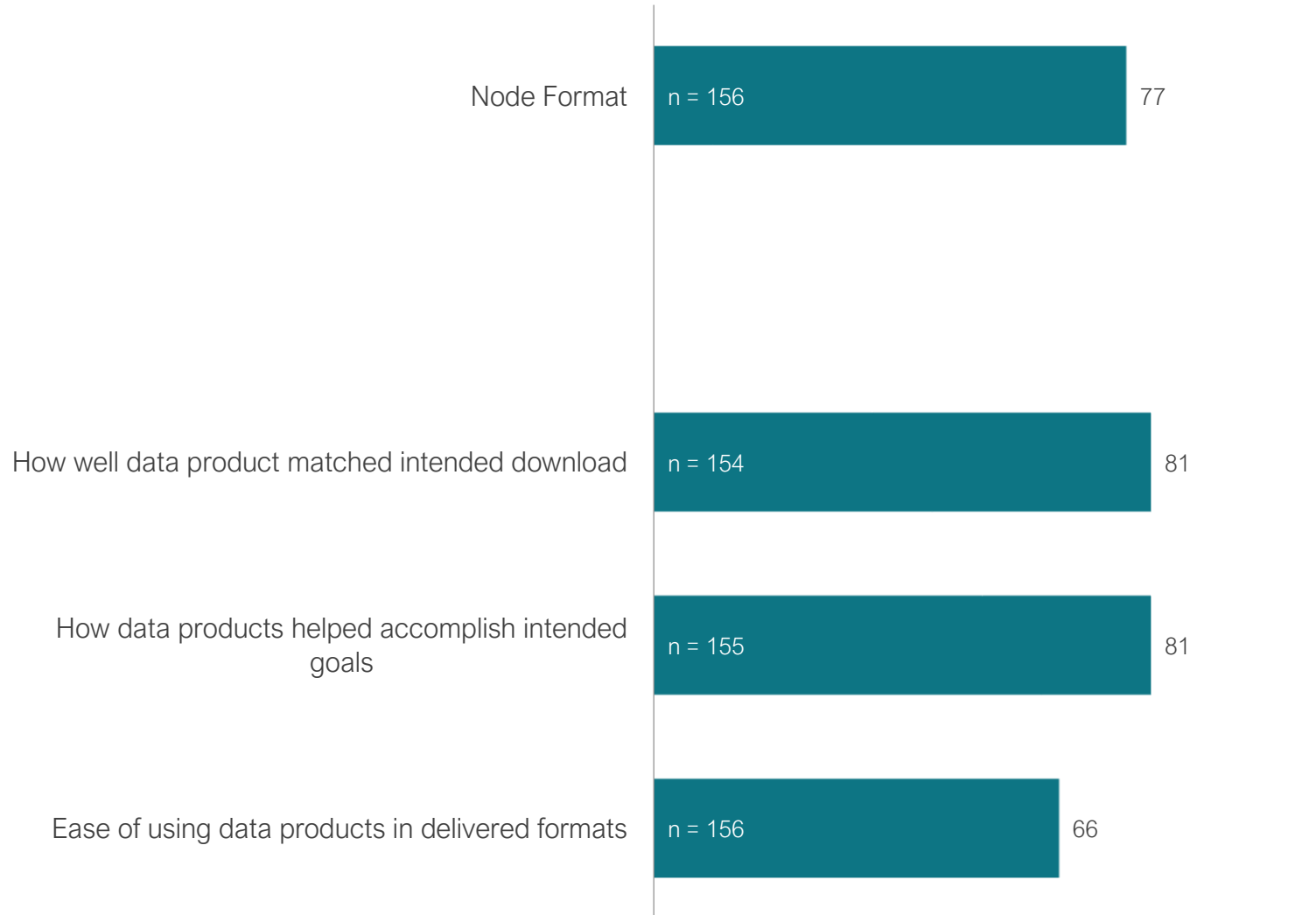
6 Non-Modeled Satisfaction Drivers

Node Search Scores

Node Search — n = 118 — 72

Ease of using search tools/capability — n = 116 — 74

How well search results met needs — n = 117 — 72

- Node Search scores are slightly higher than PDS as a whole scores. This is to be expected since users may be more familiar with the specific node data.
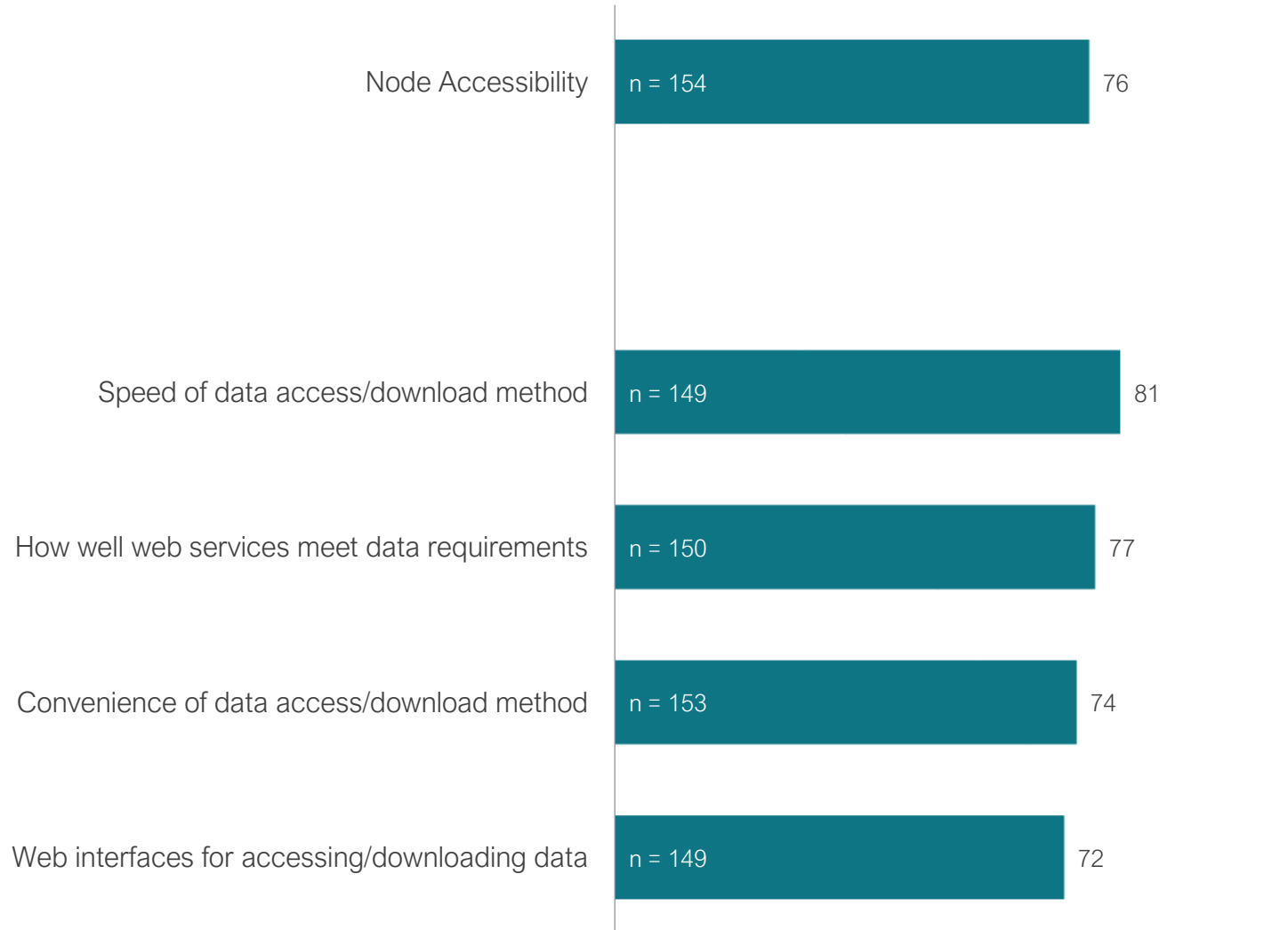
Node Format Scores

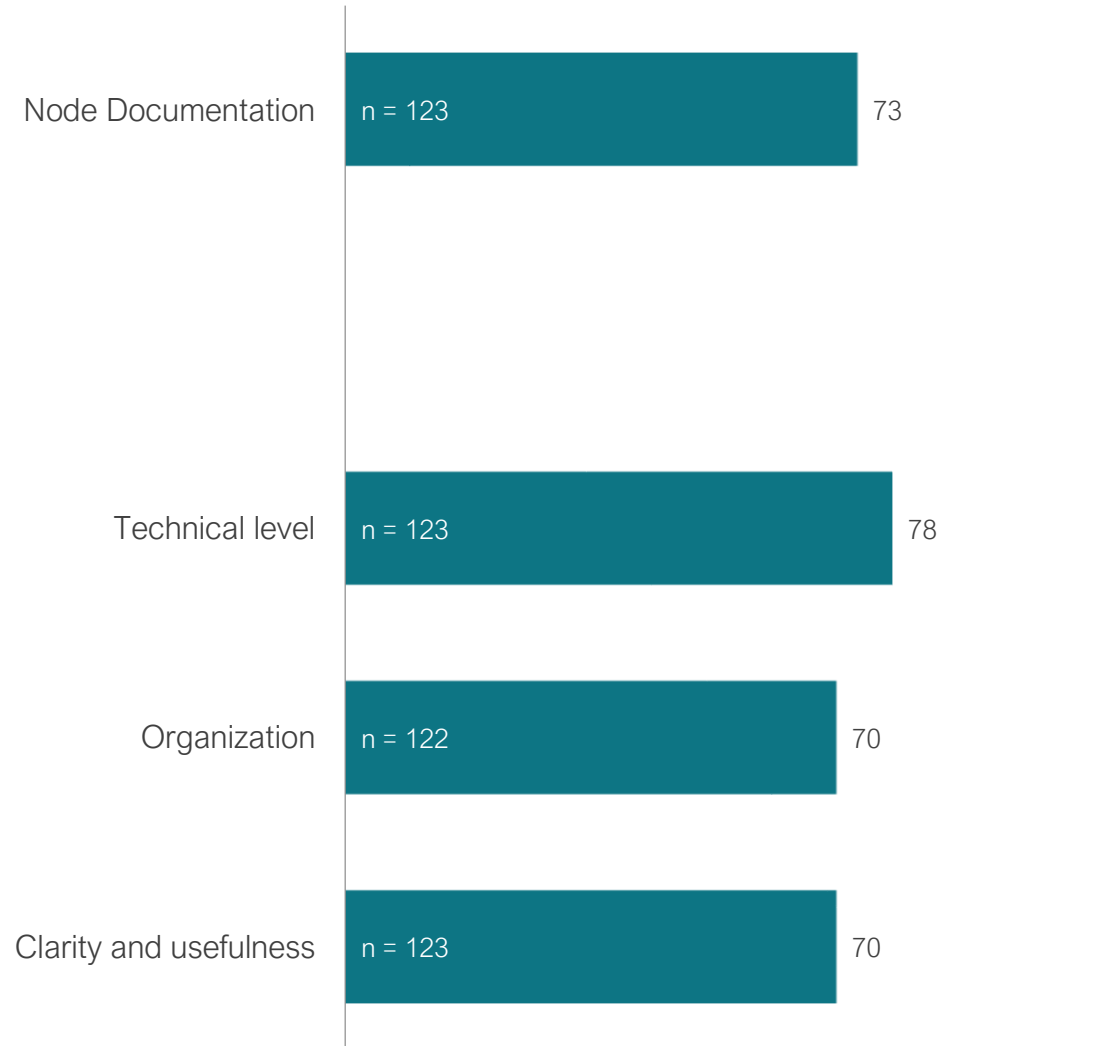| Category	n	Score
Node Format	n = 156	77
How well data product matched intended download	n = 154	81
How data products helped accomplish intended goals	n = 155	81
Ease of using data products in delivered formats	n = 156	66

- While respondents are pleased with Node Format Scores, there seems to be an opportunity to improve 'Ease of using products in the delivered formats.'
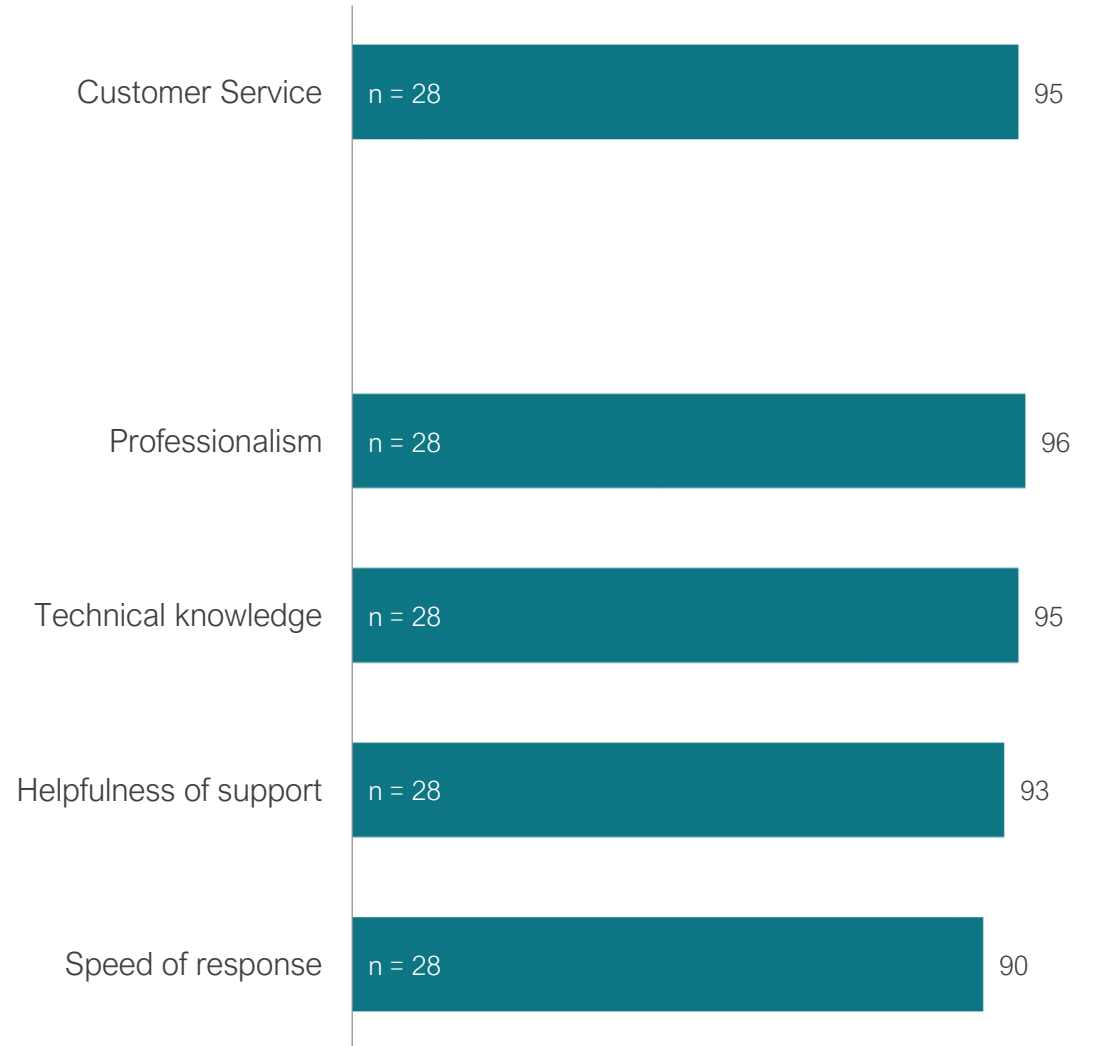
Node Accessibility Scores

Node Accessibility	n = 154	76
Speed of data access/download method	n = 149	81
How well web services meet data requirements	n = 150	77
Convenience of data access/download method	n = 153	74
Web interfaces for accessing/downloading data	n = 149	72

- Users are generally pleased with Node Accessibility with 'Speed of data access' scoring the highest and 'Web interfaces' scoring the lowest.

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Node Documentation Scores

Node Documentation — n = 123 — 73

Technical level — n = 123 — 78

Organization — n = 122 — 70
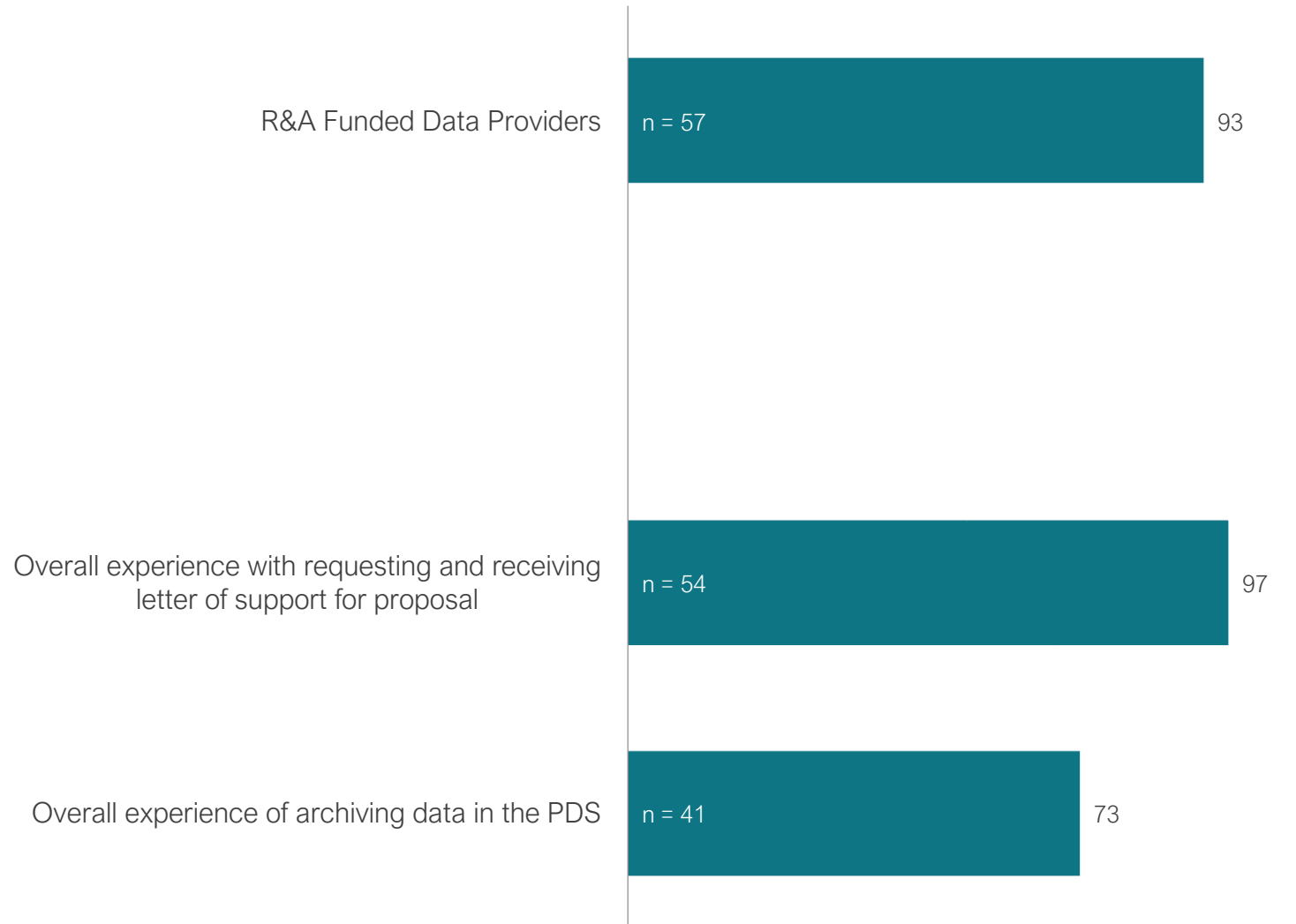
Clarity and usefulness — n = 123 — 70

- Individual node documentation may differ as noted by this user comment:

- *"In general, there is too much variation in the quality of products, documentation, tools that are provided by mission/instrument teams. Some teams provide excellent, high-quality products with superb documentation and tools to help end users access and use the data...while other teams seem to put in the bare minimum just to meet requirements…"*

Node Customer Service Scores

Customer Service	n = 28	95
Professionalism	n = 28	96
Technical knowledge	n = 28	95
Helpfulness of support	n = 28	93
Speed of response	n = 28	90

- Users were extremely pleased with all aspects of customer service.

Node R&A Funded Data Providers Scores

R&A Funded Data Providers
n = 57 — 93

Overall experience with requesting and receiving letter of support for proposal
n = 54 — 97

Overall experience of archiving data in the PDS
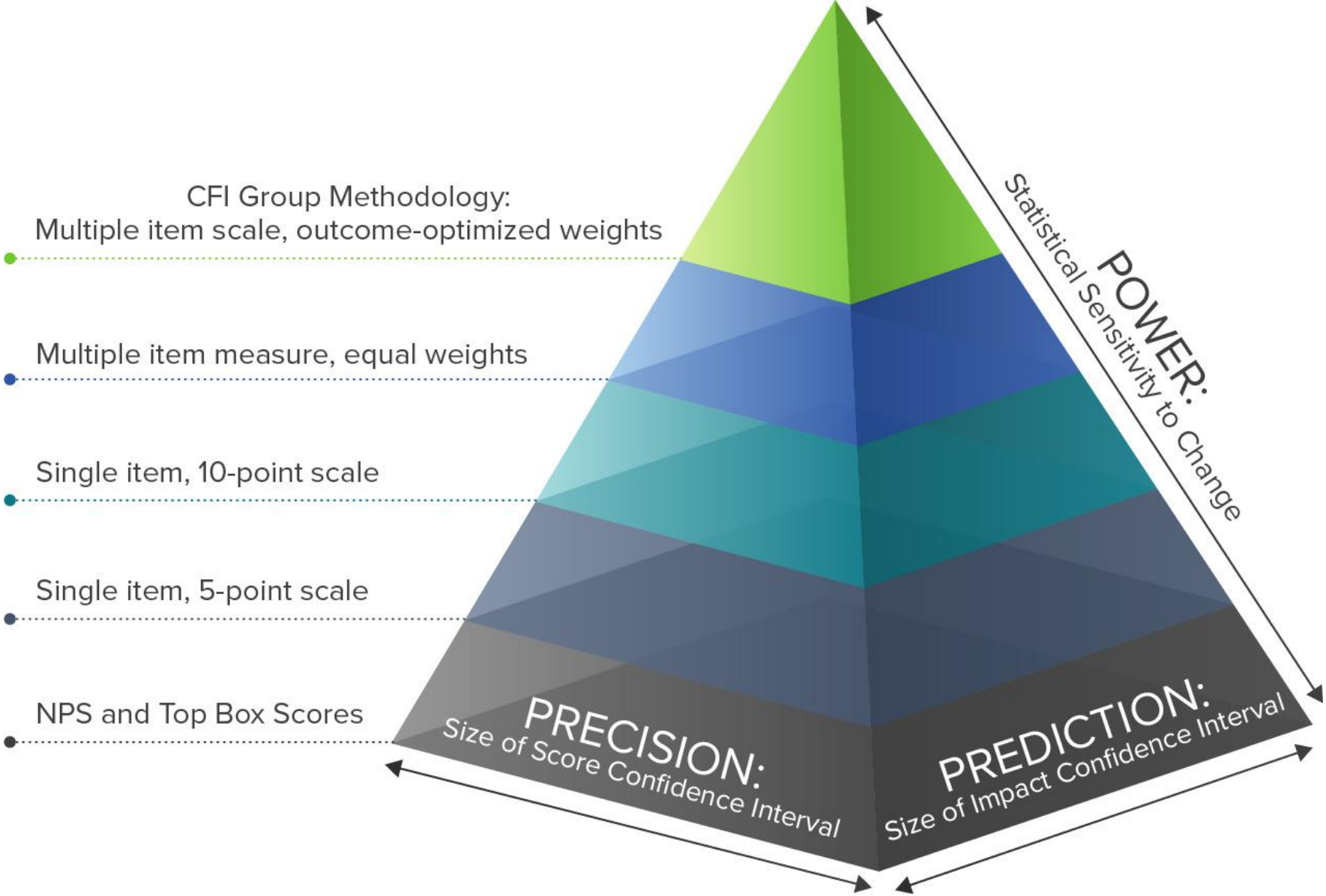n = 41 — 73

- While users were extremely pleased with their 'Overall experience with requesting/receiving support letters', there may some opportunity to tweak their 'Experience in archiving data in the PDS.'
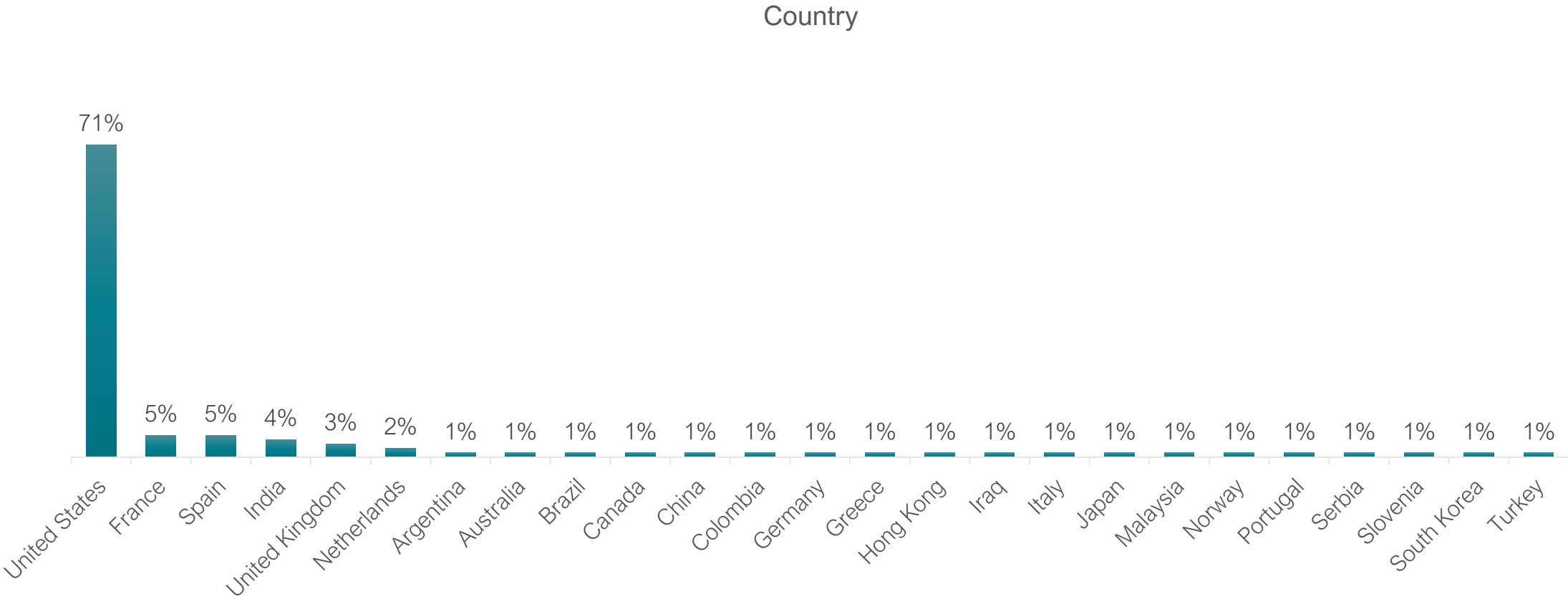
7 | Appendix

The Measurement Pyramid

CFI Group Methodology:
Multiple item scale, outcome-optimized weights

Multiple item measure, equal weights

Single item, 10-point scale

Single item, 5-point scale

NPS and Top Box Scores

POWER:
Statistical Sensitivity to Change

PRECISION:
Size of Score Confidence Interval

PREDICTION:
Size of Impact Confidence Interval

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Country of Origin Breakout

Country

CFI Group

Thank you

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