

NASA Planetary Data System Initial User Satisfaction Study

July 2022

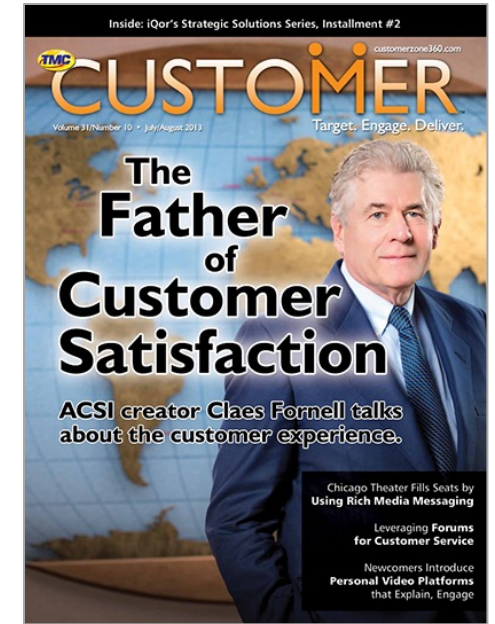


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CFI Group
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History of CFI Group

- 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
SWEDEN – Stockholm

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Study Overview

Introduction

This report documents the findings from the NASA Planetary Data System 2022 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).

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. Although this is the second study for PDS, NASA and CFI Group have partnered on many satisfaction measurements since 2013.
- The objective of the NASA PDS user study was to gather feedback from users on their experiences working with PDS. 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

- Responses were collected by sending an email to the Science Mission Directorate distribution list with an embedded URL link to the survey.
- Data was collected from March 8, 2022 to May 22, 2022. There were 256 total responses with 229 used for data analysis.

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.

Definitions

- Customer Satisfaction Index (CSI)
 - › The CSI is the weighted average of three questions that ask directly about customer satisfaction.
 - › Thinking about the PDS, 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 PDS. 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 version of PDS. 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 and have an effect on CSI.

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Executive Summary

Key Findings, Implications and Recommendations

- The 2022 customer satisfaction score (CSI) for NASA Planetary Data System (PDS) users was 63. This was three points below the 2020 score of 66 but on par with the overall Federal Government aggregated score. The lower score in 2022 can be attributed to few findings within the data:
 - CSI is a weighted average of overall satisfaction, as well as satisfaction compared to expectations and satisfaction compared to an ideal. The overall satisfaction score for PDS was 69. This score represent their general overall satisfaction with PDS. Both the scores for satisfaction compared to expectations (59) and satisfaction compared to ideal (58) were noticeably much lower. This indicates that user expectation are higher than the experience is currently delivering. Anything that can align expectations with experience should help improve CSI.
 - Respondents from the United States made up the majority of respondents (80%). This is an increase of nine percentage points from the last study. US respondents tend to score lower on the satisfaction metrics than respondents from other parts of the world and increased US participation this year contributed to the lower scores in 2022.
- Respondents were generally willing to recommend PDS to others (78) and most believed they would again use services provided by NASA PDS in the future (84). Since these scores are substantially higher than CSI, this indicates a certain level of loyalty among PDS users.

Key Findings, Implications and Recommendations

- From the satisfaction model, provider services tended to score higher overall than data user services.
 - Both Provider Archive (71) and Data User Accessibility (61) had the highest impact on satisfaction
 - Due to its combination of higher impact and lower overall score, both Data User Accessibility and Data User Documentation/Training (67) should be top priorities to increase overall CSI scores in the future.
- Respondents had the following characteristics:
 - A majority of respondents (78%) searched at least ten times in the last year.
 - Half of respondents identified with the Planetary Surface research discipline.
 - Just under half (47%) do not use other non-planetary NASA data.
 - In addition to Google, ODE and Planetary Image Atlas were the most popular PDS search tools
 - There seemed to be some confusion regarding archiving needs. While most respondents indicated a need to archive data, methods and/or software, over a quarter of respondents did not know their archiving needs.
 - Just under half (45%) require high end computing power and 39% were likely to use machine learning techniques.

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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 16), 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 Provider Archiving increased by five points (71 to 76), the CSI score would increase by the amount of its impact, 2.0 points, (from 63 to 65). 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.

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.

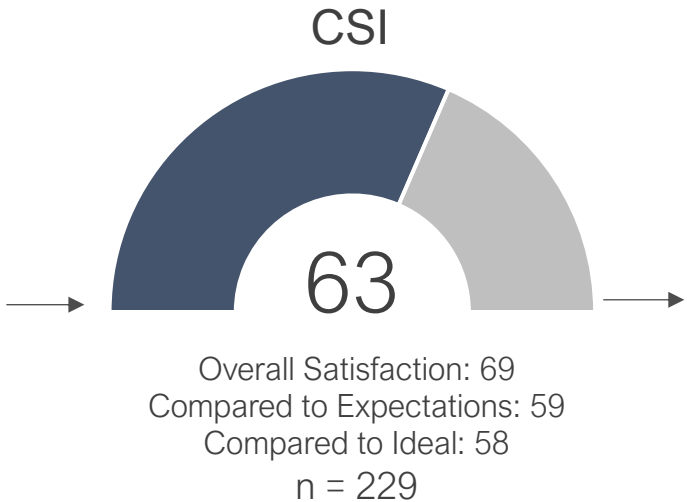
- Exceptional: 90-100
- Excellent: 80-89
- Good: 70-79
- Average: 60-69
- Below Average: Less than 60

The overall average Customer Satisfaction Index for the Federal Government is 63.

NASA PDS Satisfaction Model

Satisfaction Drivers

71	2.0	Provider Archiving
61	1.4	Data User Accessibility
67	0.9	Data User Documentation and Training
72	0.6	Data User Services
75	0.5	Data User Data Archive
63	0.3	Data User Search
74	0.0	Data User Customer Service
71	0.0	Provider Training
78	0.0	Provider Services



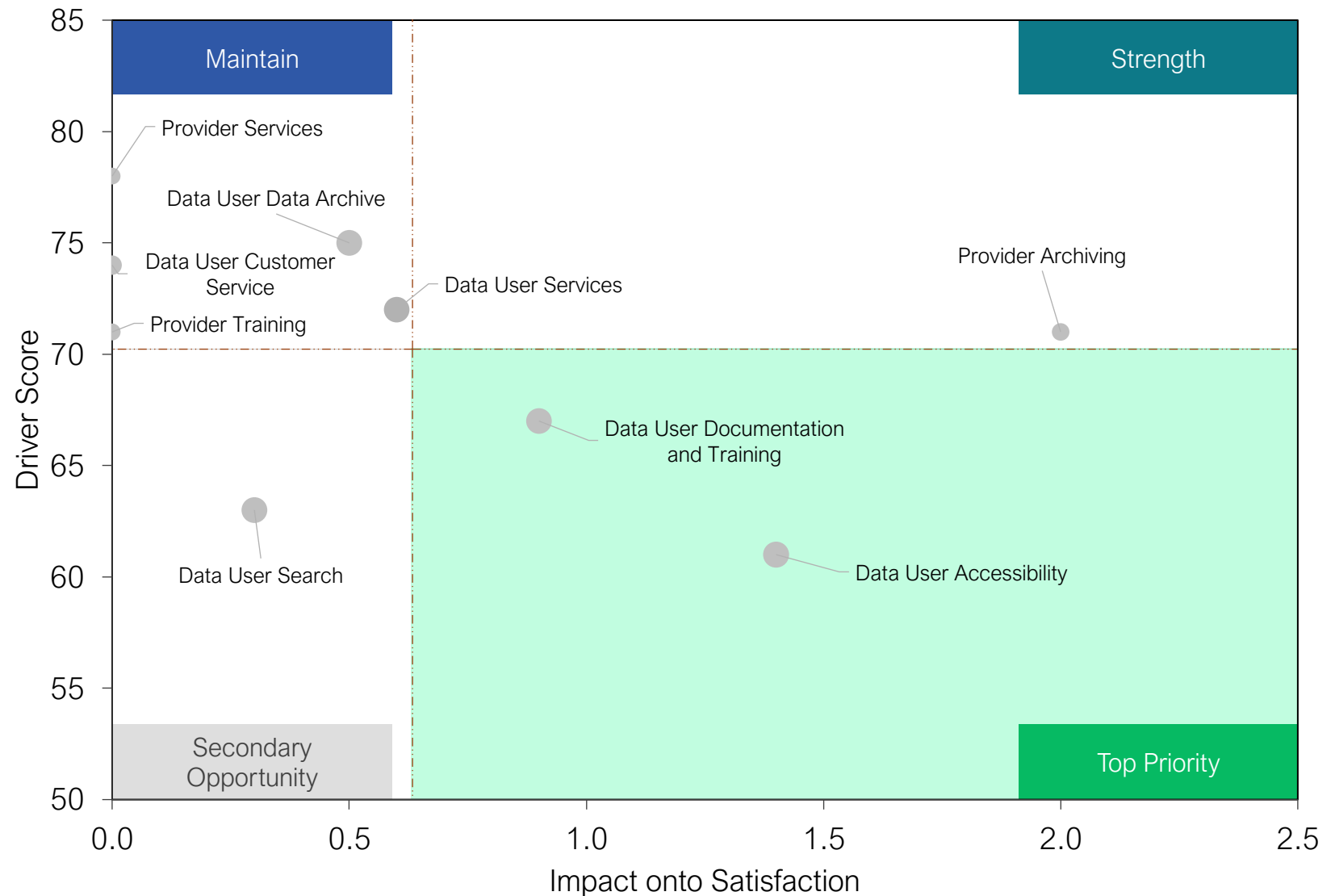
Future Behaviors

Recommend	4.8	78
Future Use	3.6	84
Future Use - Provider Archiving	1.7	92

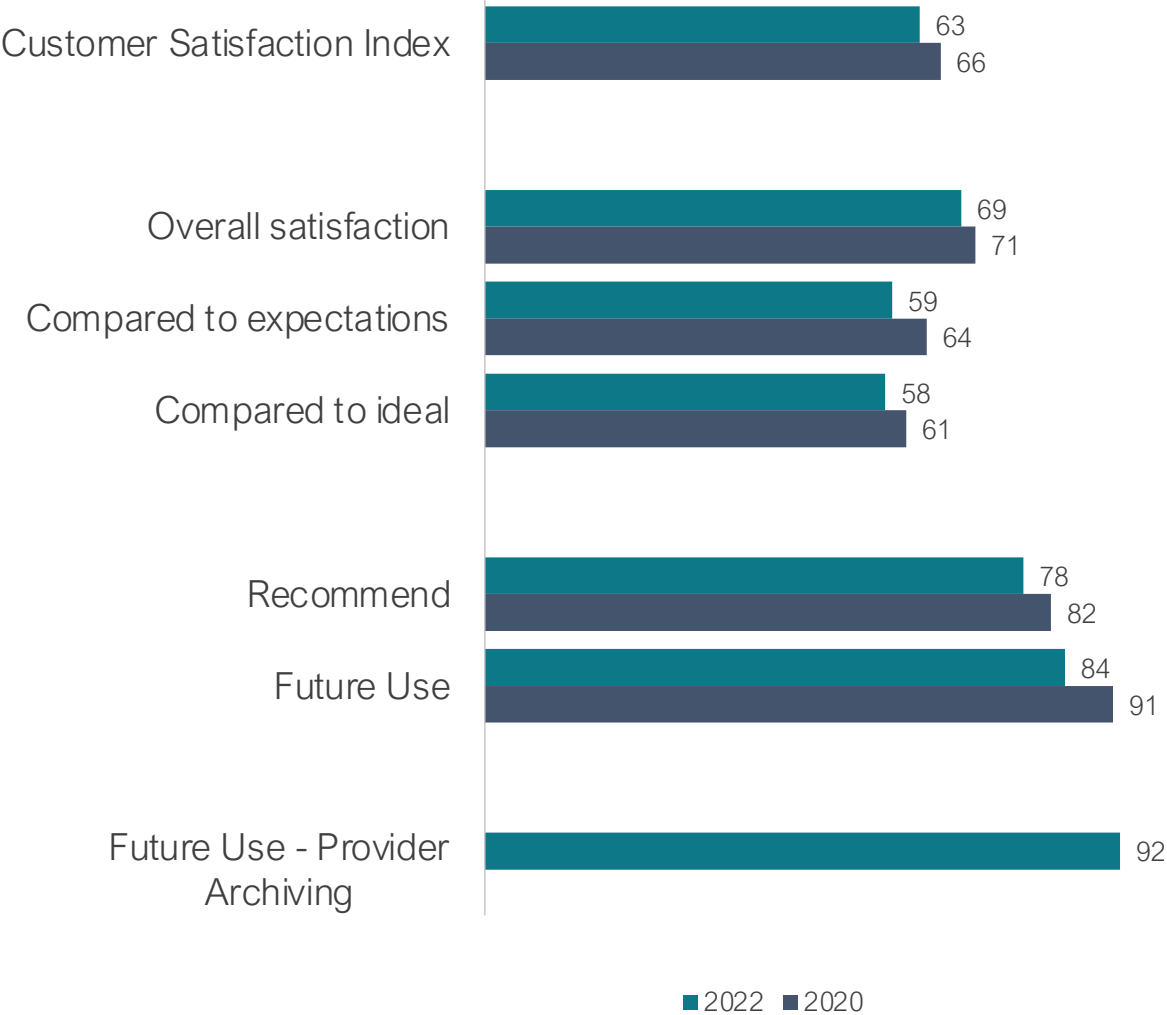
- Scores represent your performance as rated by customers.
- Impacts show you which driver has the most/least leverage – where improvements matter most/least to your customers
- Shows effect of CSI on Future Behaviors

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.

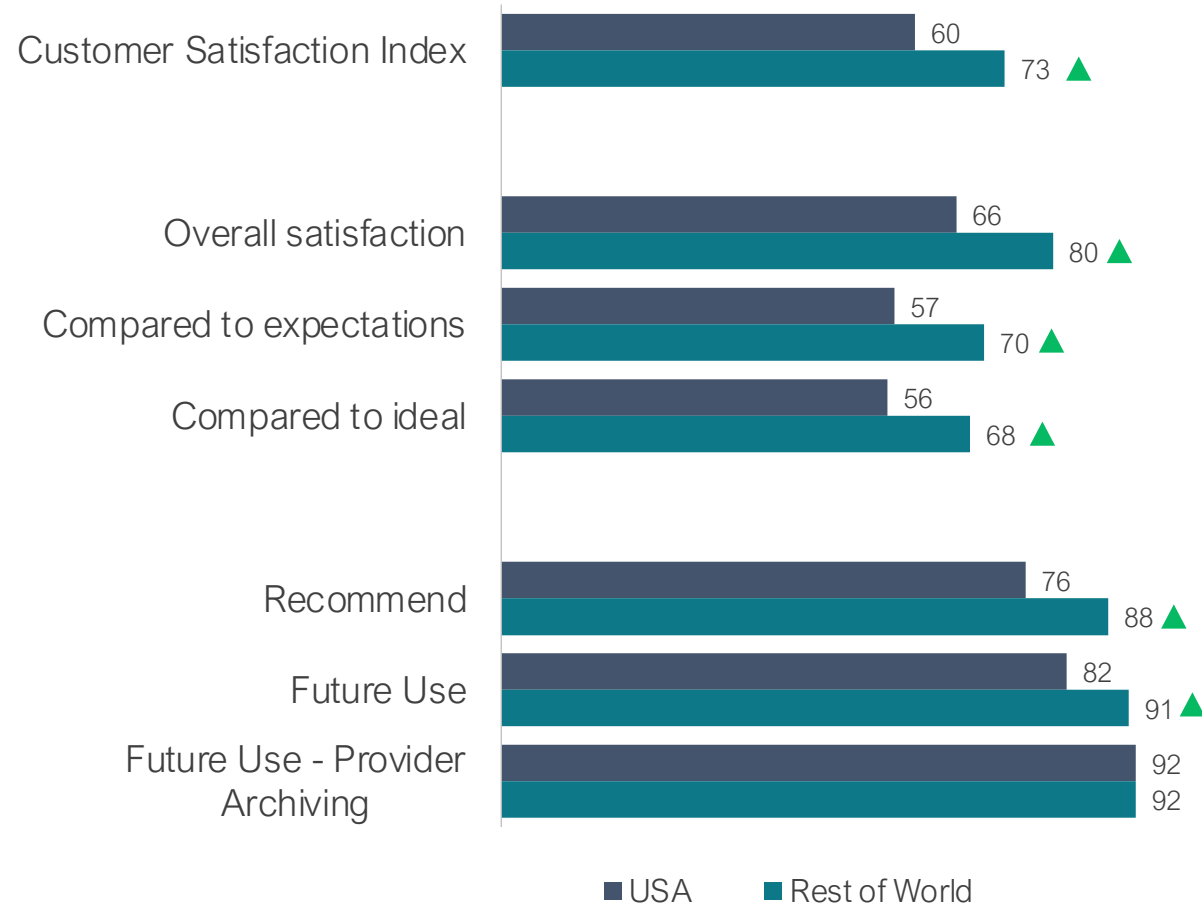


Satisfaction and Future Behaviors



- CSI dipped slightly in 2022 with a score of 63. This is on par with the Federal Government ACSI average.
- The satisfaction scores for both Compared to Expectations and Compared to Ideal continue to be noticeably lower than the score for Overall Satisfaction. This indicates, that although users are relatively satisfied, they have higher expectations that are not being met. Anything that would better anticipate user expectations should help increase CSI.
- Recommend and Future Use scores are much higher than CSI.

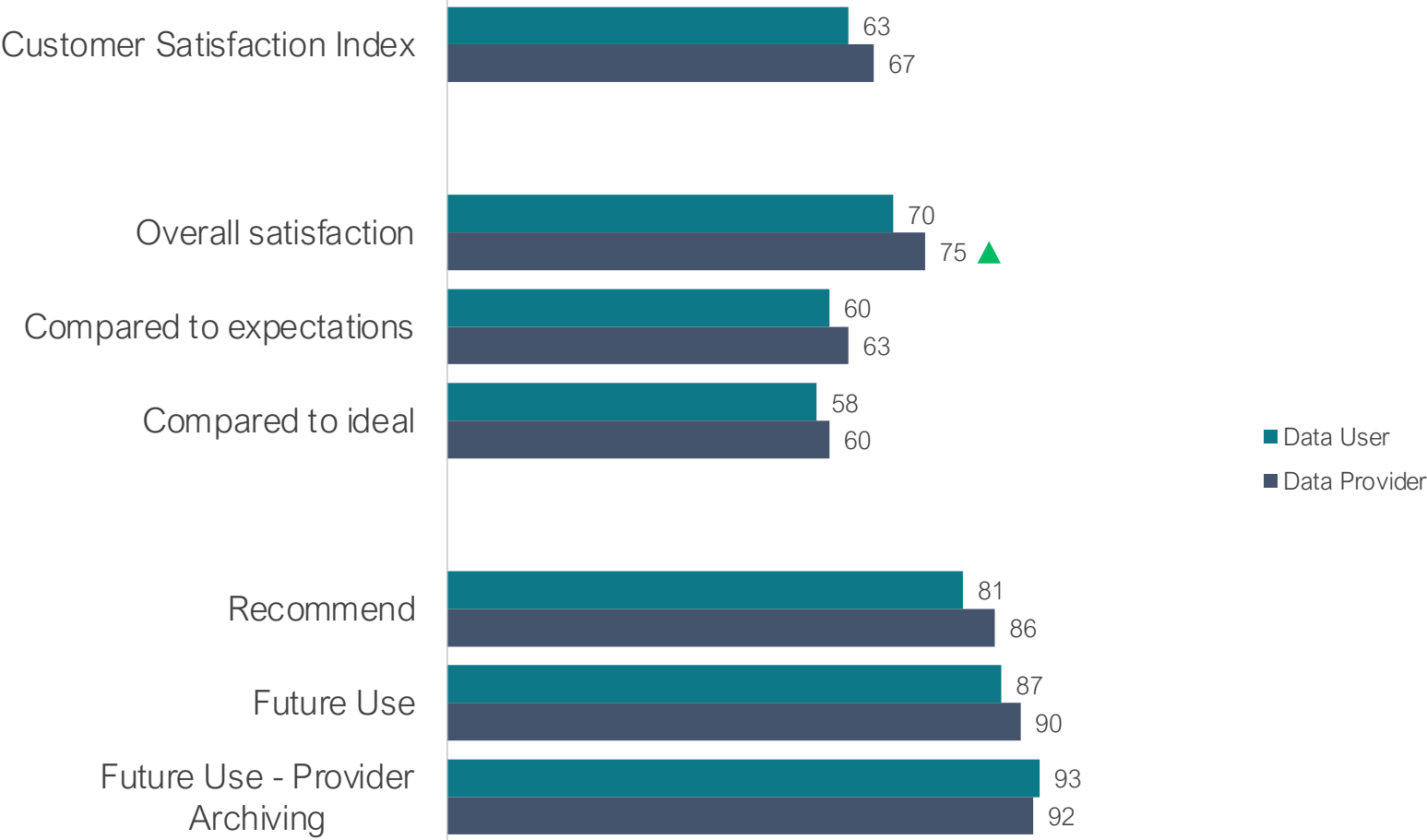
United States vs Rest of the World Satisfaction



▲ ▼ Indicates change is significant at 90% confidence

- The United States accounted for 80% of all responses. This is an increase from 71% in 2020.
- American respondents tended to post lower satisfaction scores across the board.

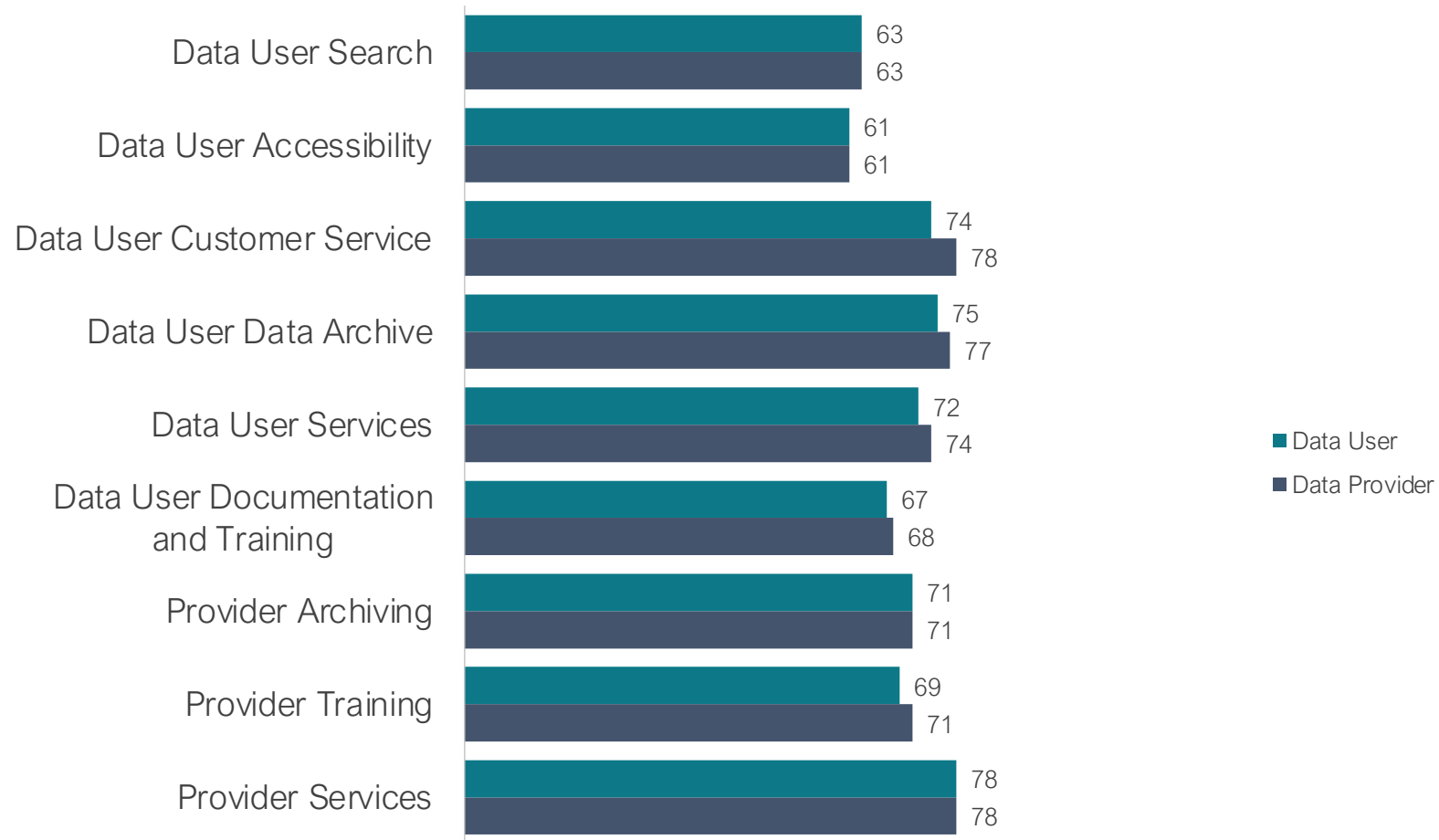
User Type – Satisfaction and Future Behaviors



■ Data Providers tend to score slightly higher than Data Users.

▲ ▼ Indicates change is significant at 90% confidence

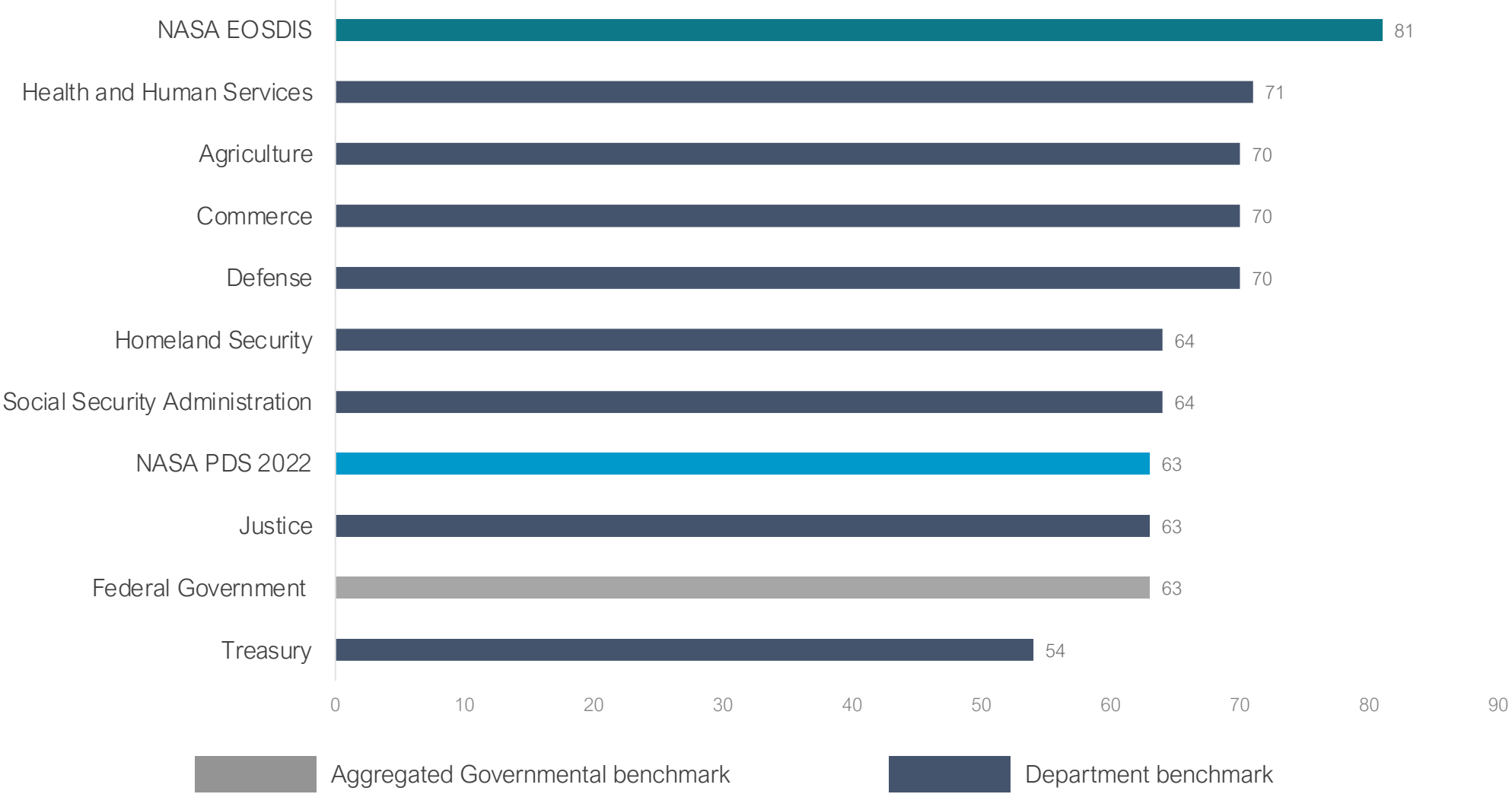
User Type – Satisfaction Drivers



- Provider Services, Data User Customer Service and Data User Data Archive were the highest rated satisfaction drivers for both data users and data providers.

▲ ▼ Indicates change is significant at 90% confidence

NASA is on par with aggregated Federal Government score



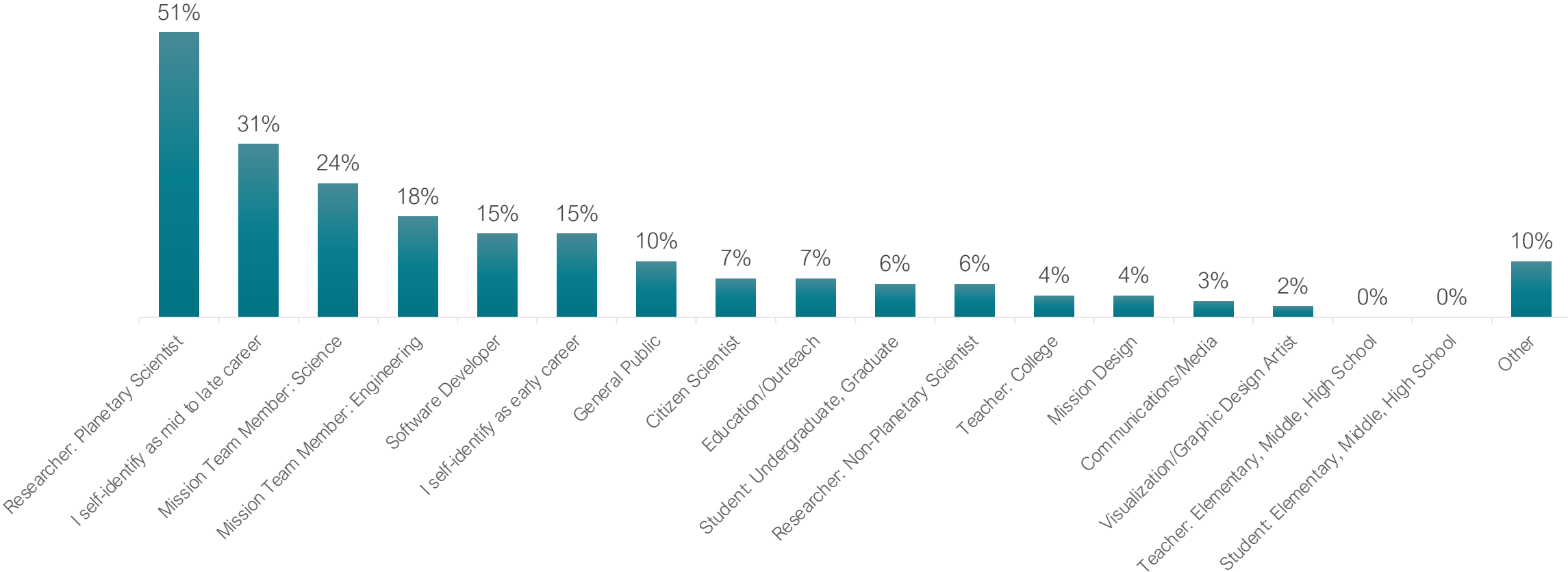
Benchmarks are from <https://www.theacsi.org/the-american-customer-satisfaction-index> and represent 2021 summary scores

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Respondent
Demographics

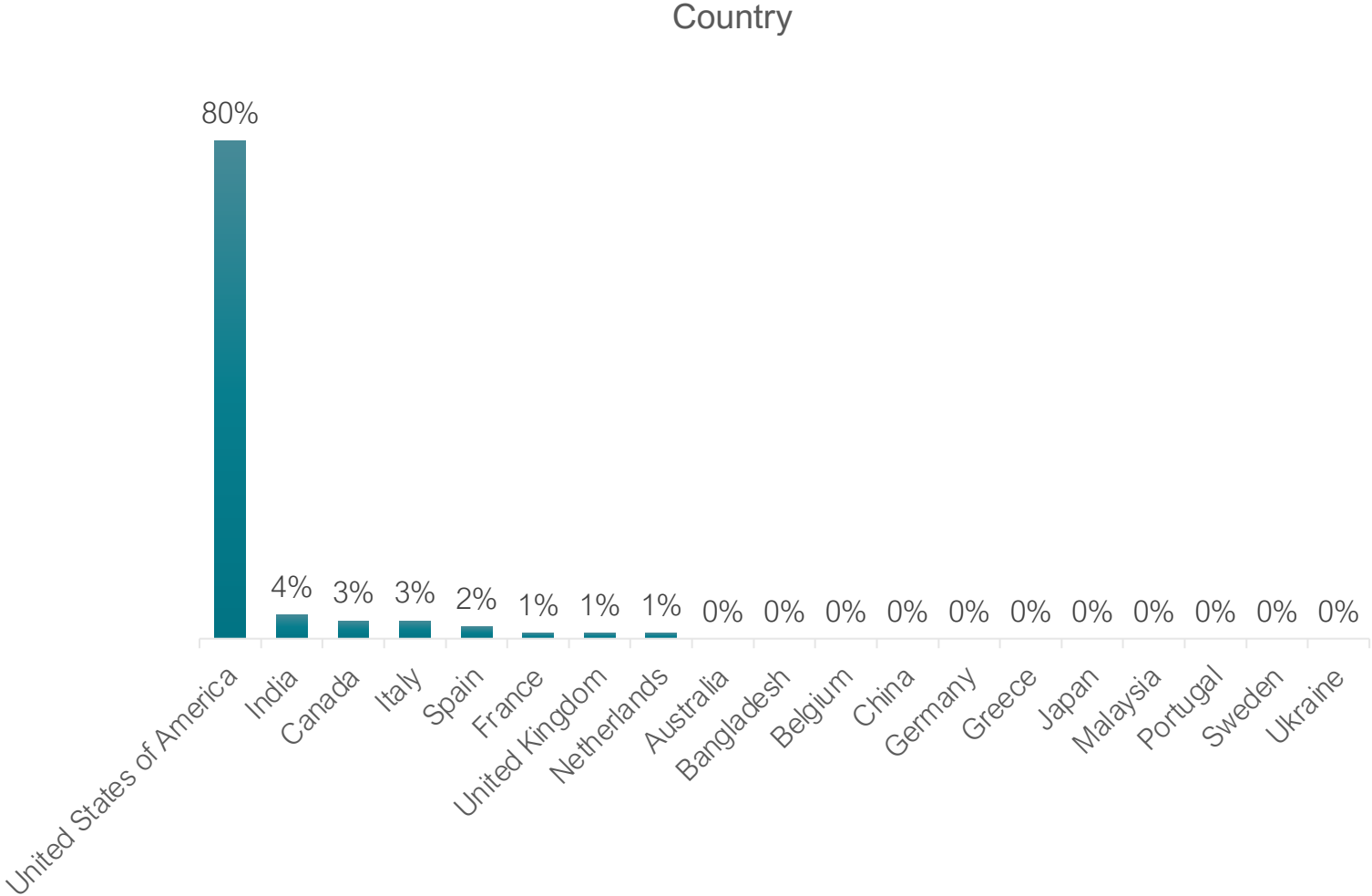
User Affiliation

- Just over a half (51%) of users identified as a “Planetary Science Researcher”



Respondents could select multiple options

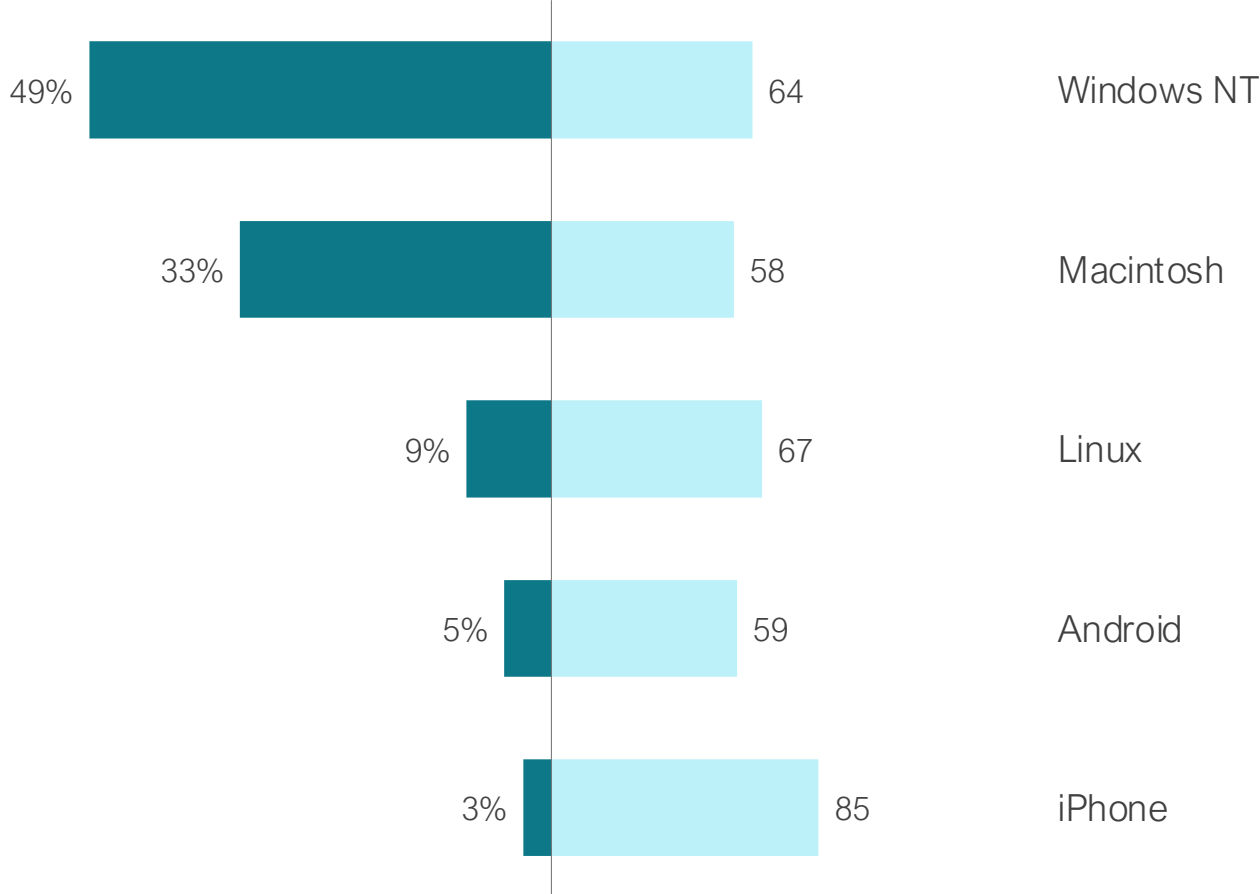
Country of Origin



2022	
Country	Frequency
Country	
United States of America	183
India	10
Italy	7
Canada	6
Spain	4
France	3
United Kingdom of Great Britain and Northern Ireland	3
Netherlands	2
Australia	1
Bangladesh	1
Belgium	1
China	1
Germany	1
Greece	1
Japan	1
Malaysia	1
Portugal	1
Sweden	1
Ukraine	1
Number of Respondents	229

Respondent Operating System

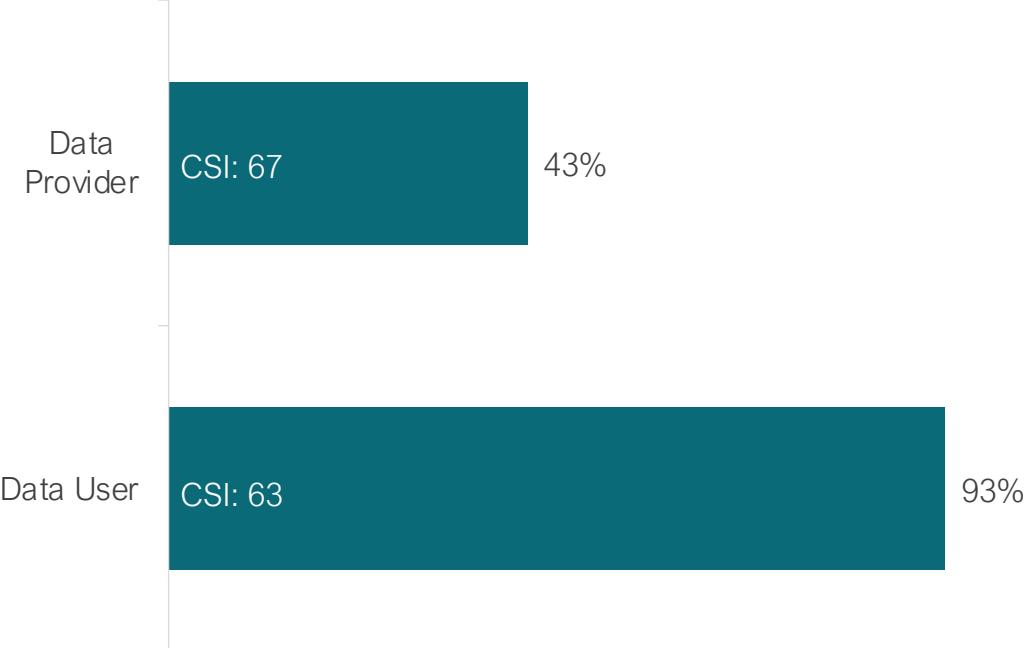
- Just about half (49%) of respondents work on the Windows operating system.



User Type

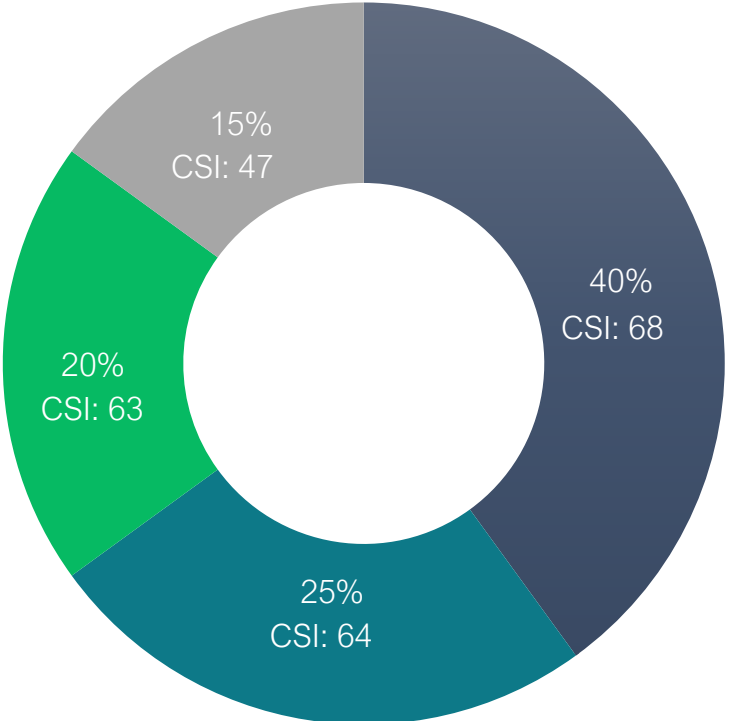
- Although respondents could select multiple roles, almost all respondents (93%) selected “Data User” with 80% having at least “Moderate Experience.”

User Category



Respondents could select multiple options

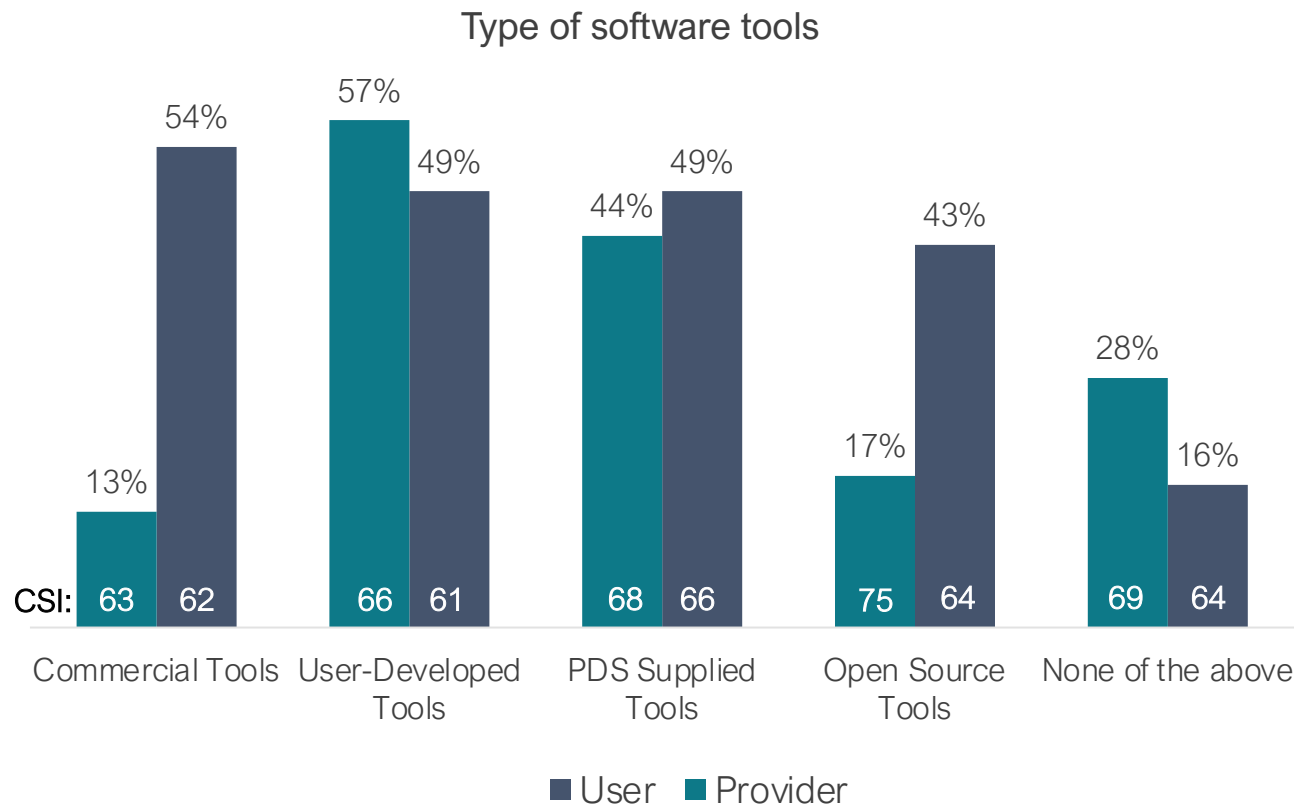
Experience Level



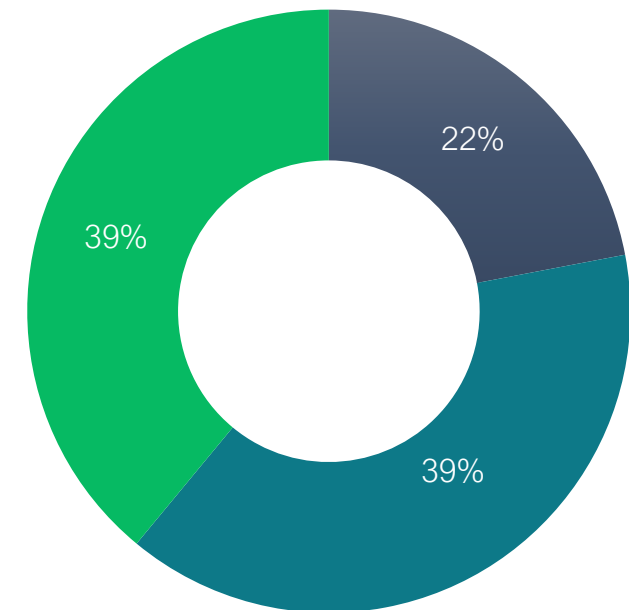
■ Moderate experience ■ Extensive experience ■ Little experience ■ Expert

Types of software tools

- Data providers tended to gravitate toward self developed and PDS supplied tools while data users augmented with commercial tools.
- A majority of respondents (78%) searched at least ten times a year.



Users – Frequency of finding data they are looking for

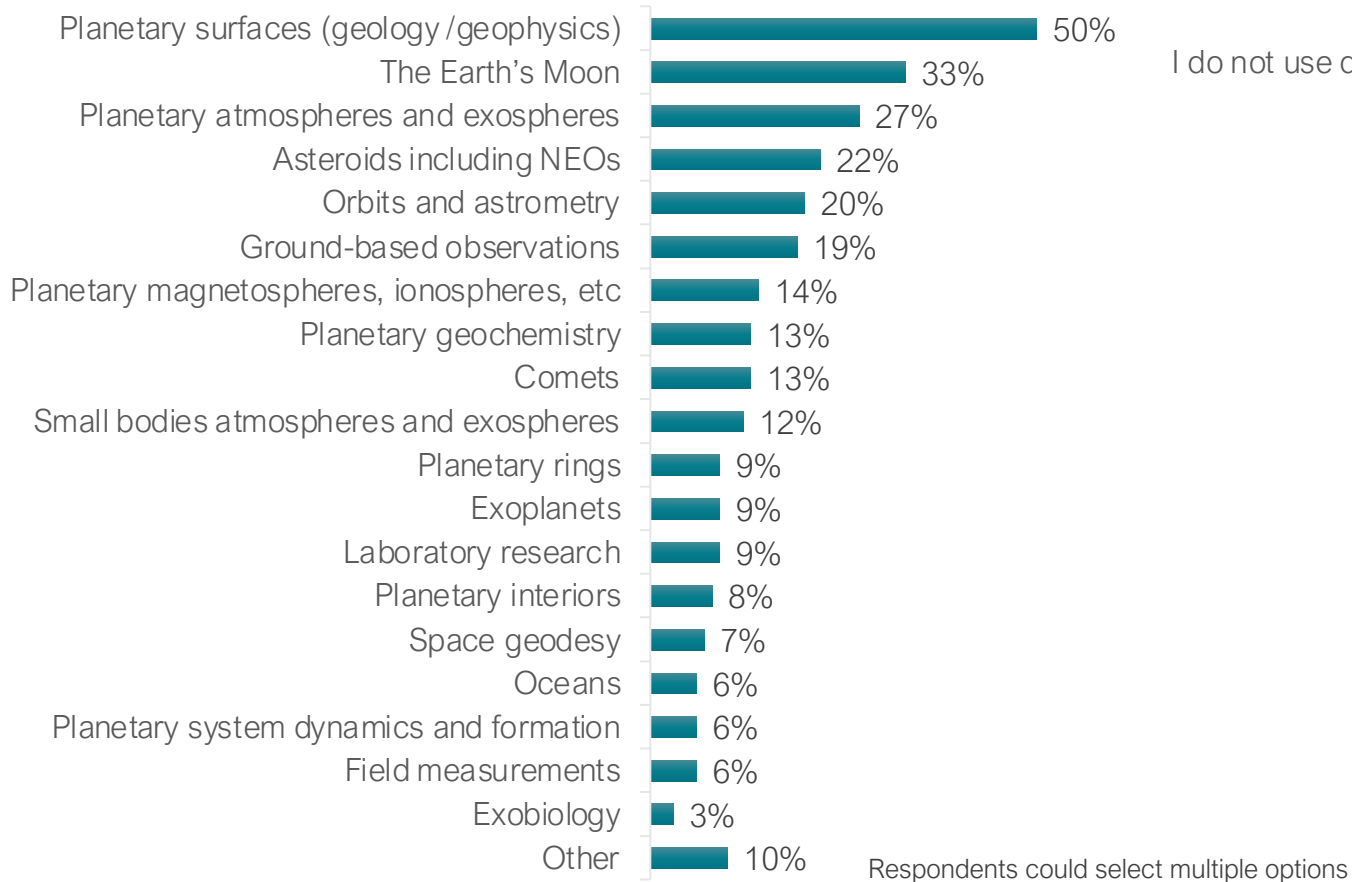


- Rarely - up to a few times per year
- Sometimes - up to 10 times per year
- Often - more than 10 times per year

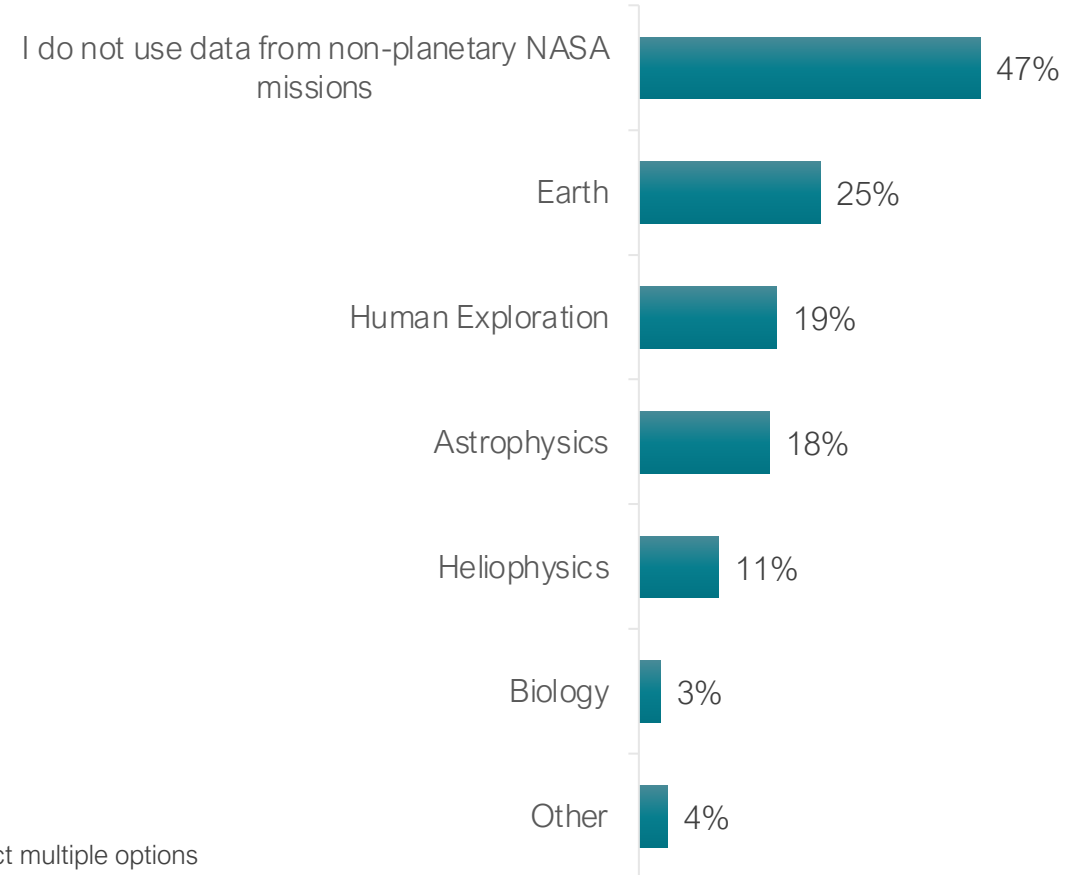
Research Areas or Disciplines

- Planetary Surface is the most popular research discipline.

Research areas or disciplines use PDS science data or services



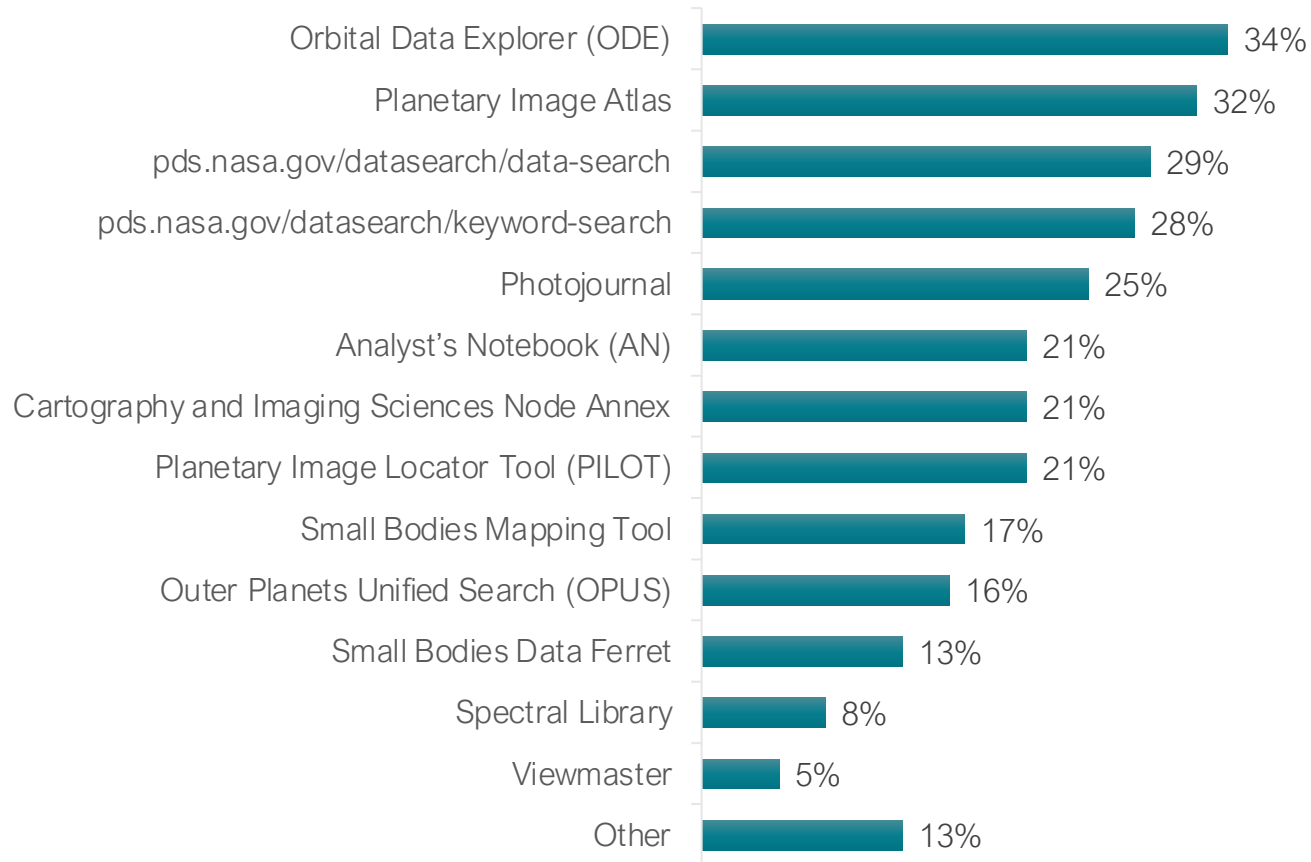
Use data from other non-planetary NASA missions in your research



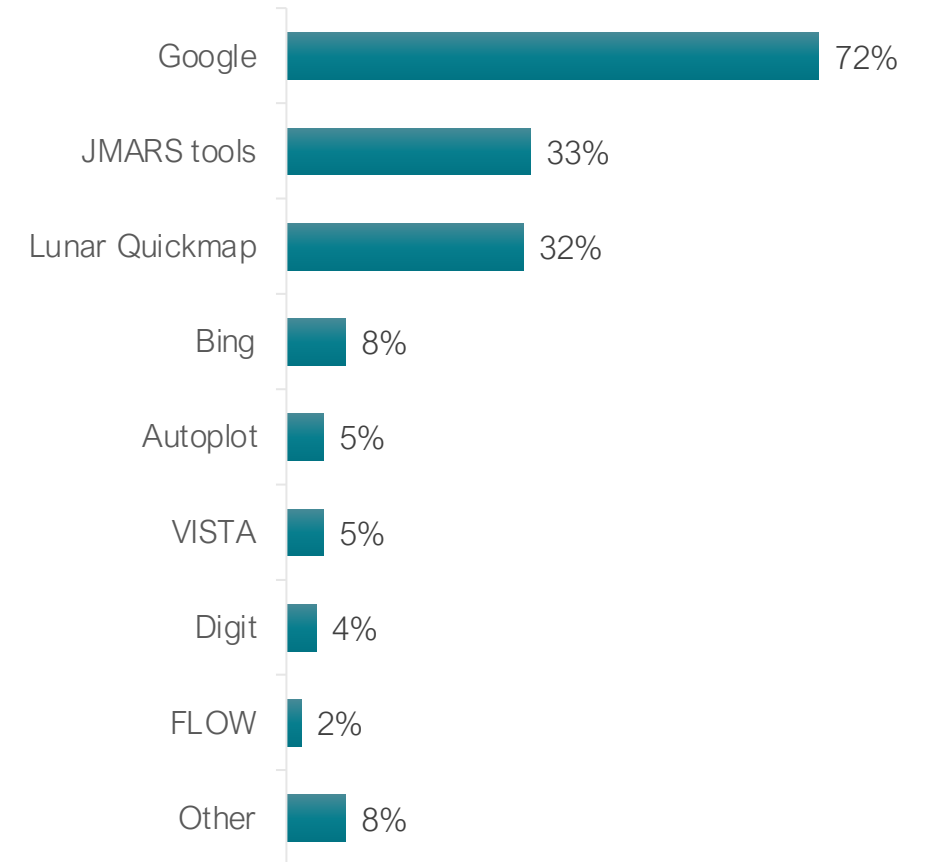
Search Tools

- ODE and Planetary Image Atlas were the most popular PDS search tools while Google was also popular.

User - PDS Search tools used to find planetary mission data

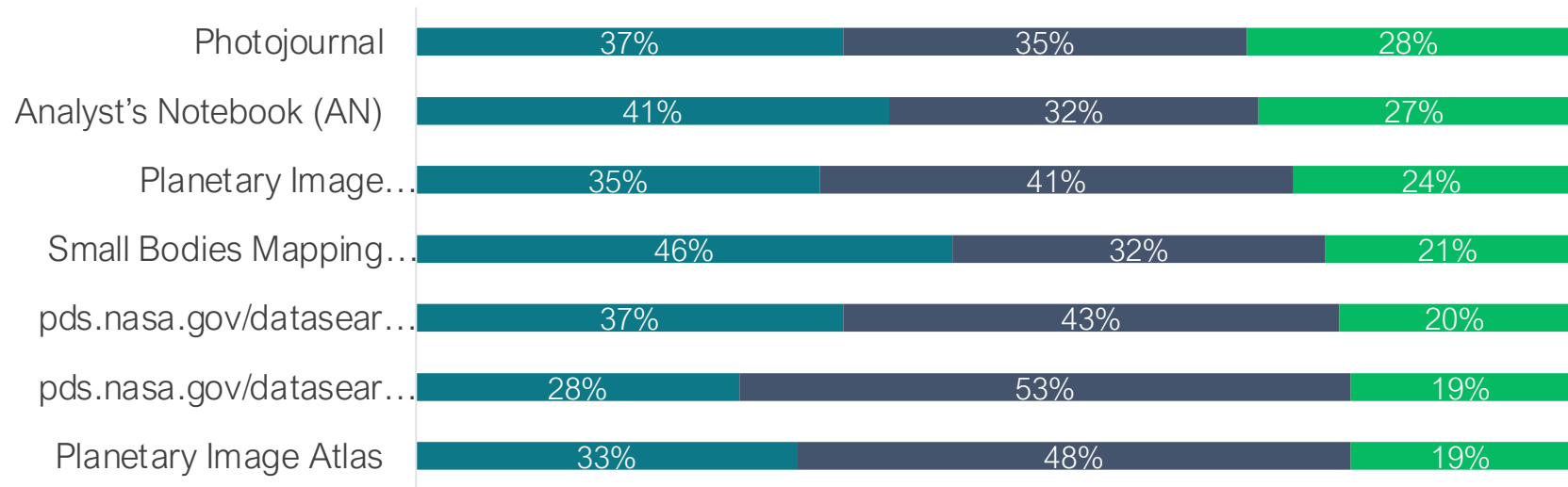
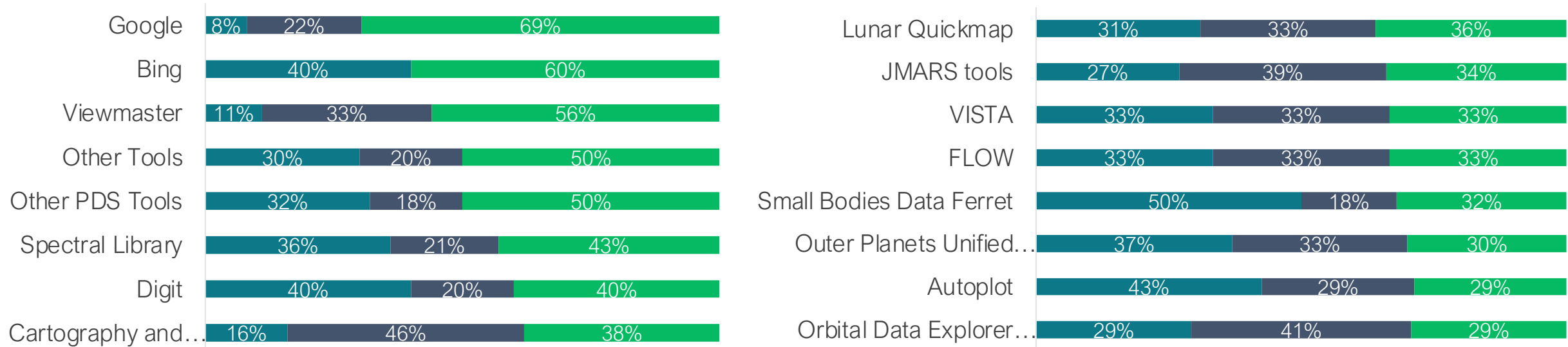


User - Other Search tools used to find planetary mission data



Respondents could select multiple options

User Tool Frequency

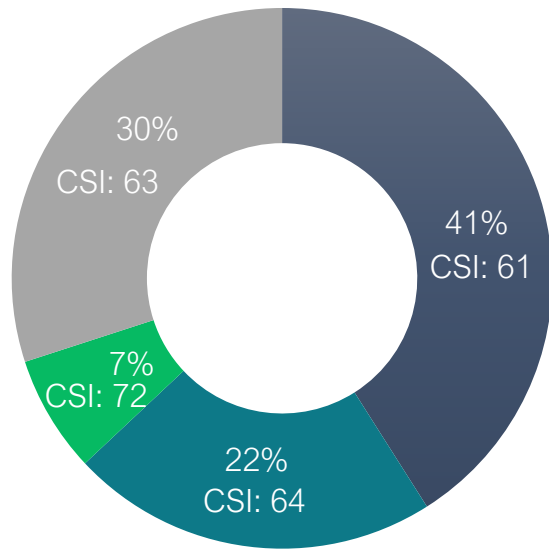


■ Rarely - up to a few times per year
■ Sometimes - up to 10 times per year

Need to Archive

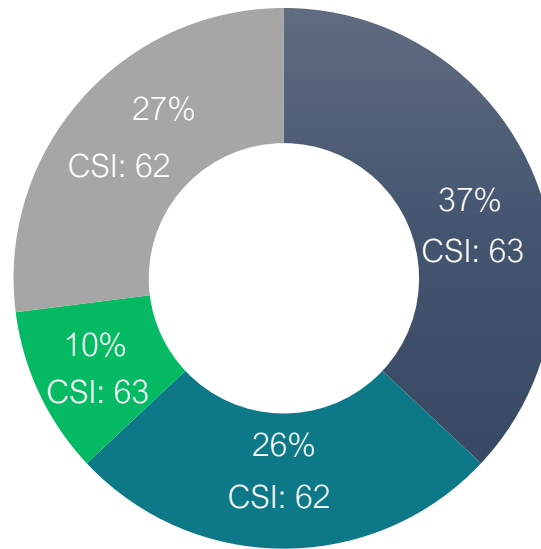
- While most indicated a need to archive as part of a PDS archive, over a quarter of respondents did not know their archiving needs.

Need for instrument teams to archive their software



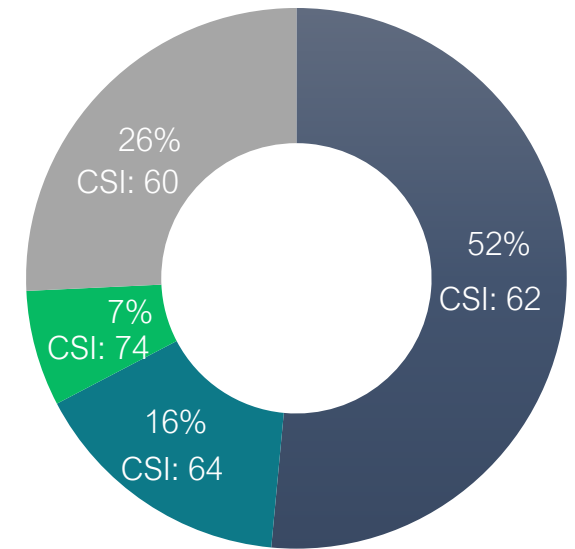
- Yes, as part of PDS Archive
- Yes, though not part of a PDS Archive
- No
- I don't know

Need to archive scientific methods



- Yes, as part of PDS Archive
- Yes, though not part of a PDS Archive
- No
- I don't know

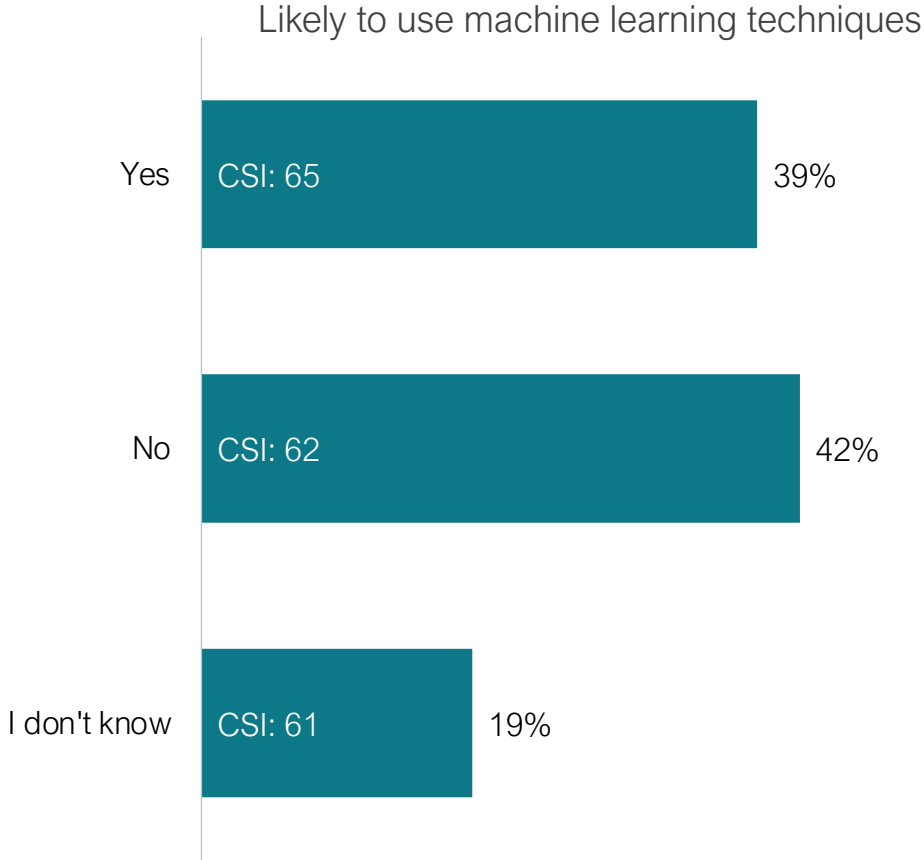
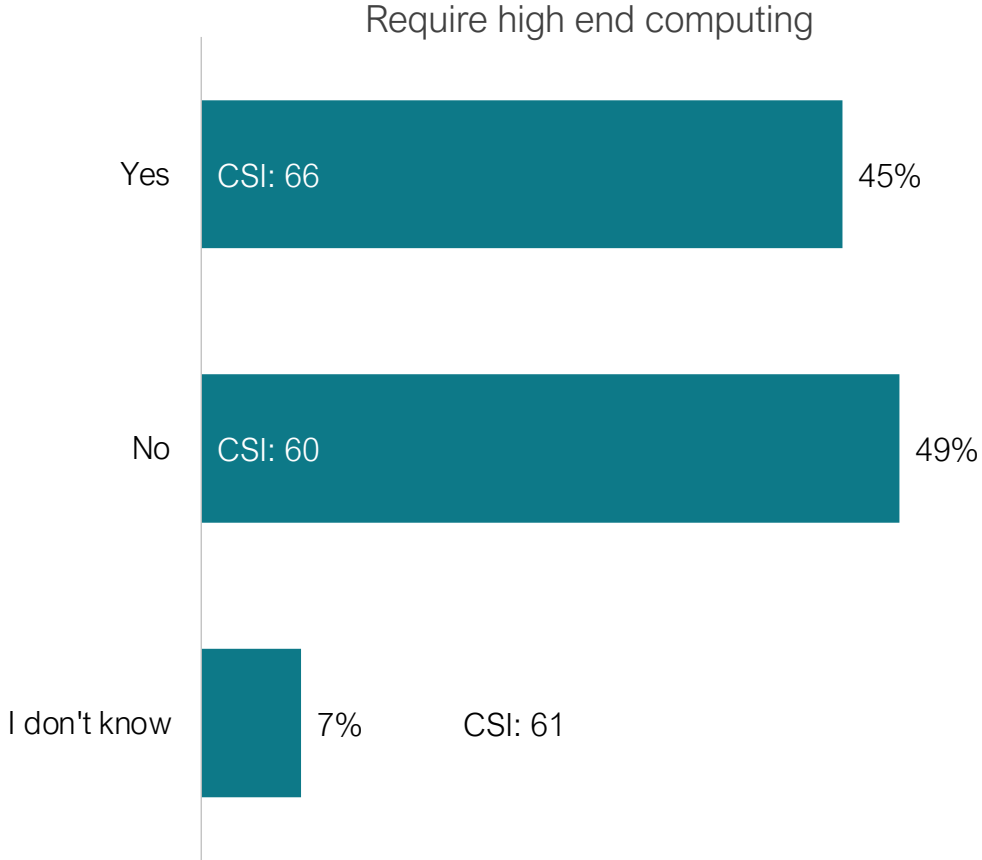
Need to archive spacecraft engineering data



- Yes, as part of PDS Archive
- Yes, though not part of a PDS Archive
- No
- I don't know

High End Computing and Machine Learning Techniques

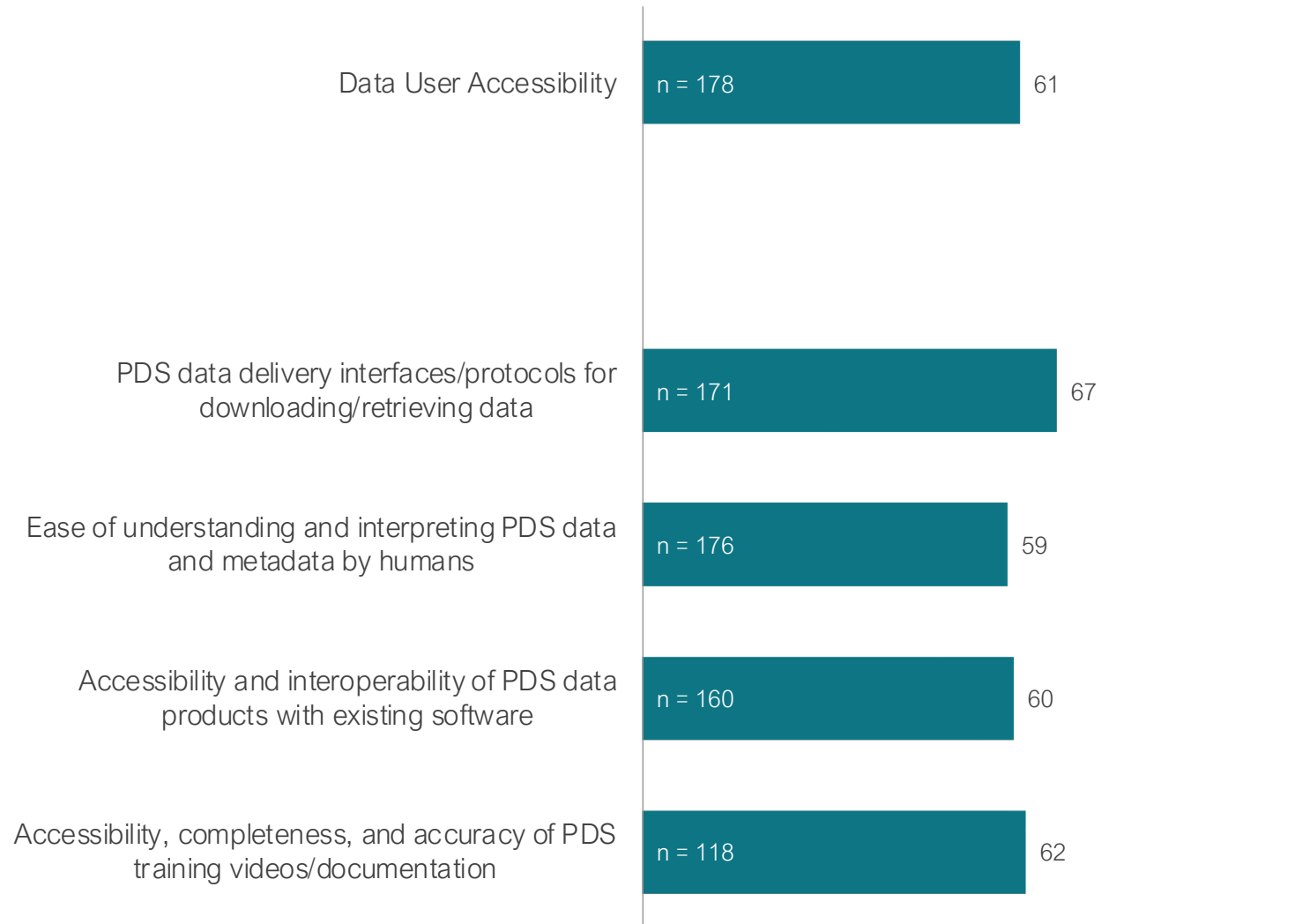
- High end computing and machine learning tools are used but are not particularly wide-spread.



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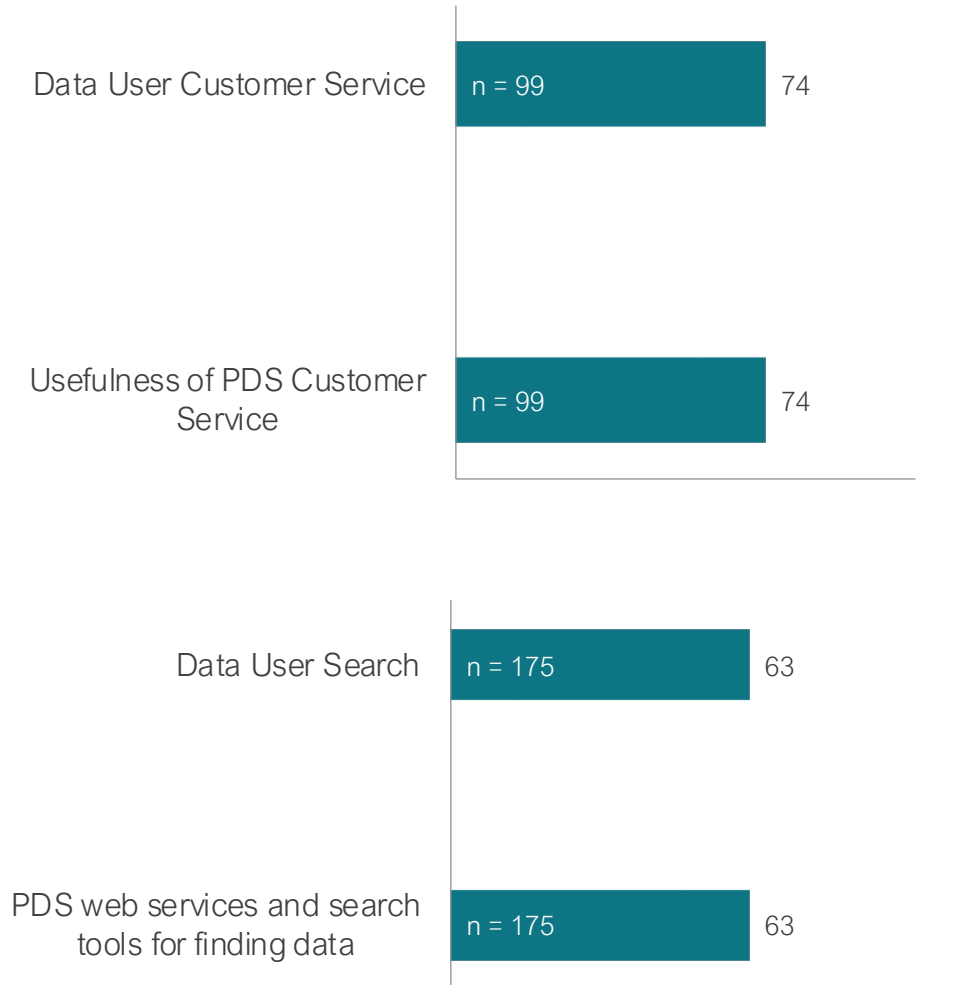
Modeled Satisfaction
Drivers

Data User Accessibility Scores



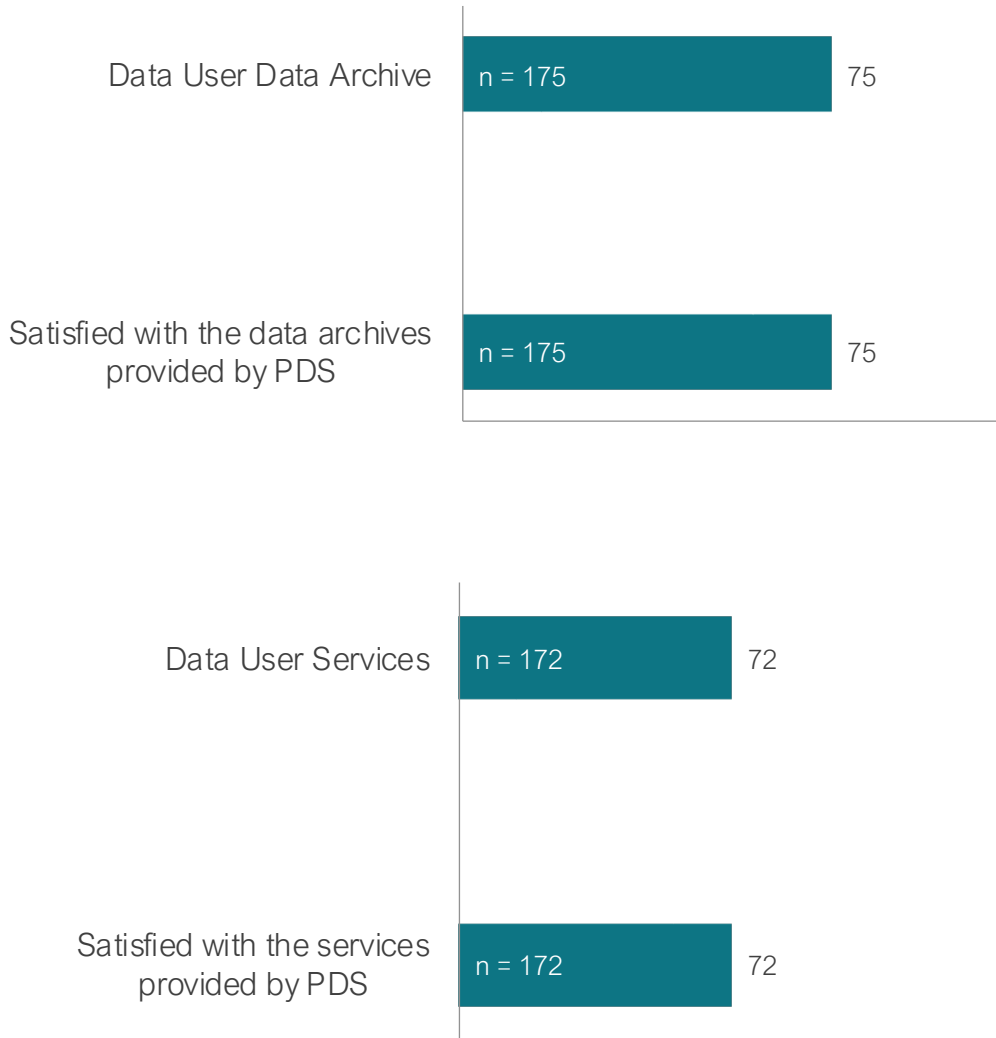
- Data User Accessibility was the lowest rates satisfaction driver. The largest area for improvement is in the ability for people to interpret the data and PDS accessibility with existing software.
- Since Data User Accessibility has a moderate effect on satisfaction, any improvements here should have a positive effect on CSI.

Data User Search and Customer Service Scores



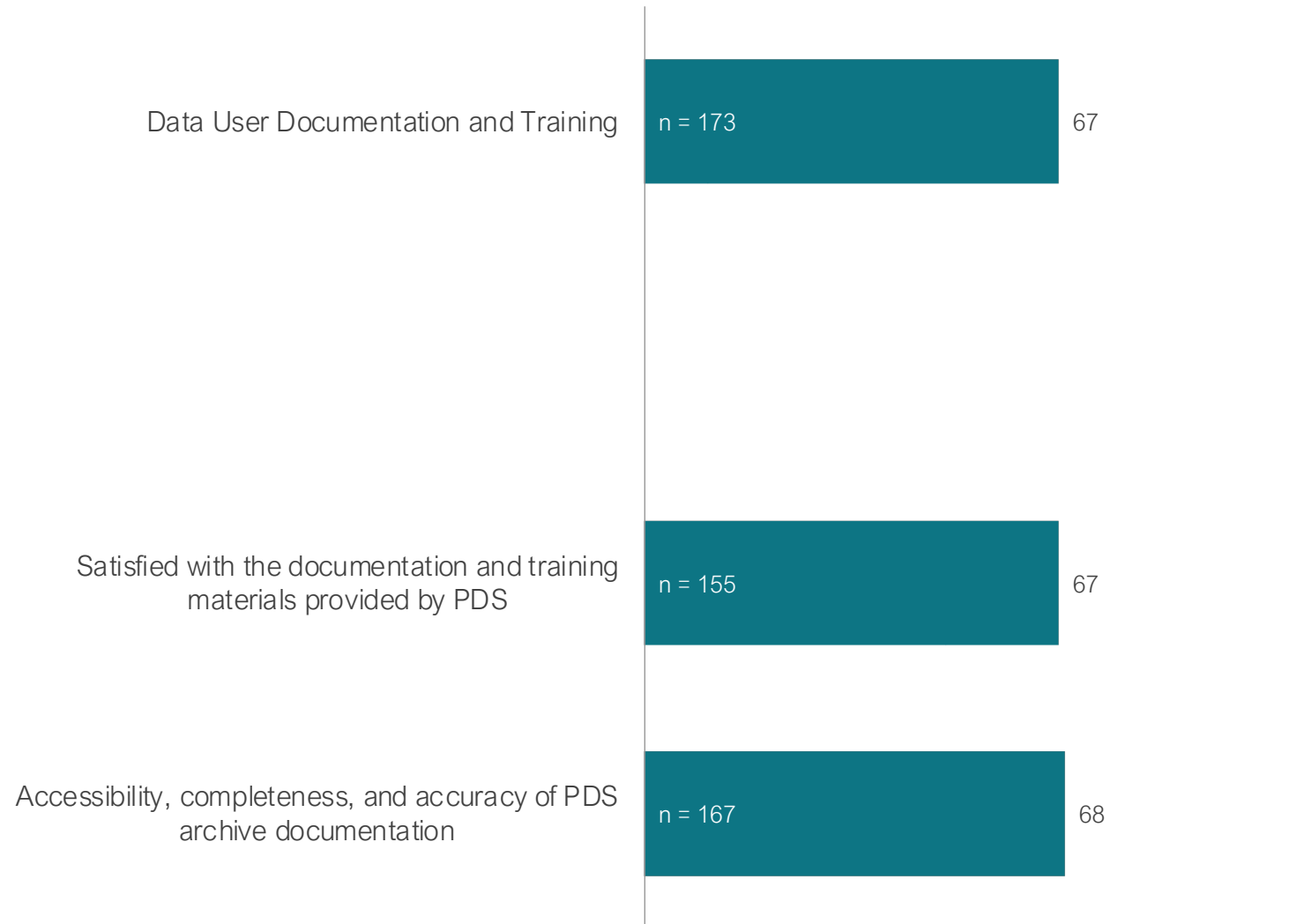
- Respondents were generally pleased with Data User Customer Service.
- Data User Search had some room for improvement.

Data User Data Archive and Service Scores



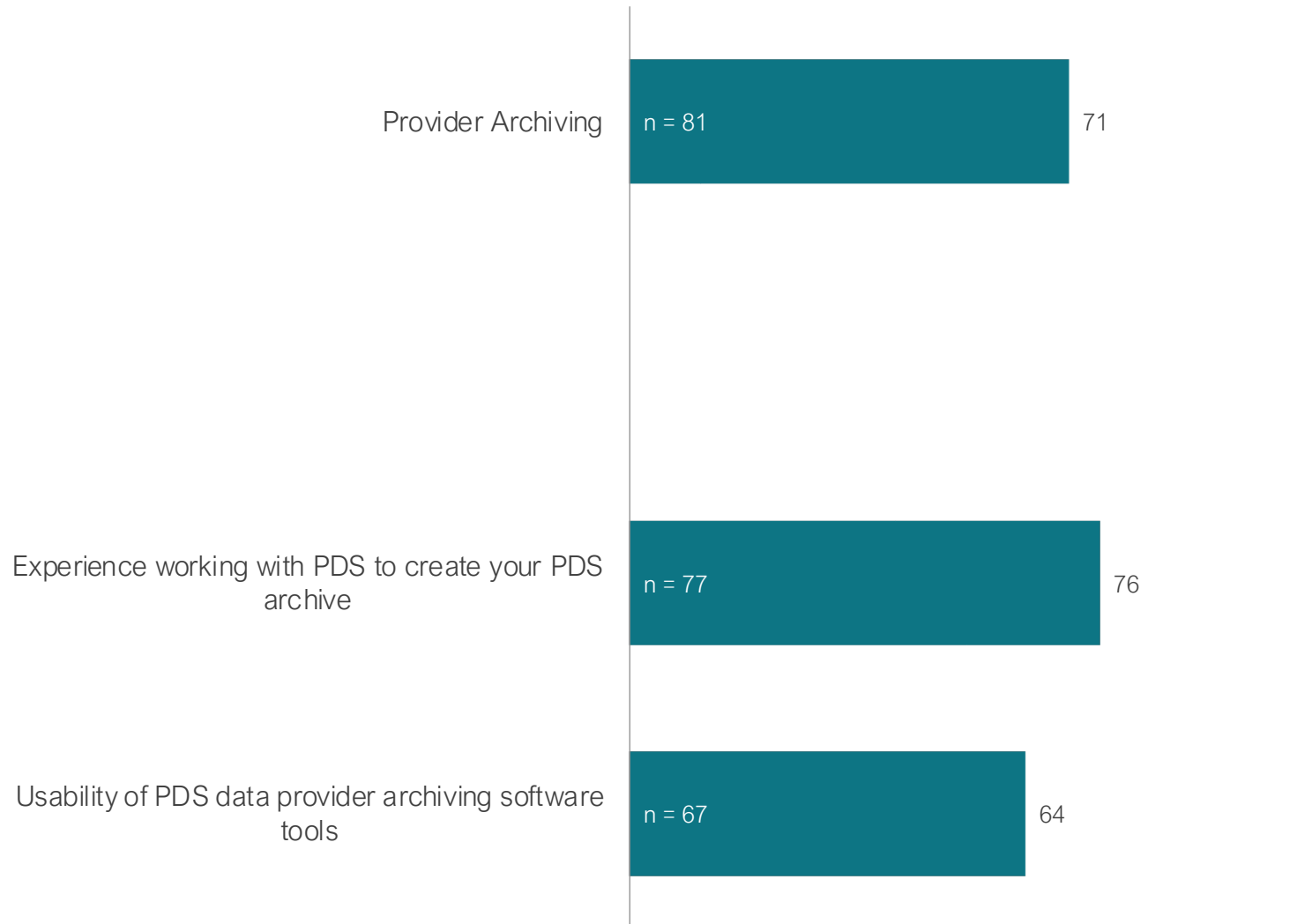
- Respondents were generally pleased with Data User Data Archive and Data User Services.

Data User Documentation and Training Scores



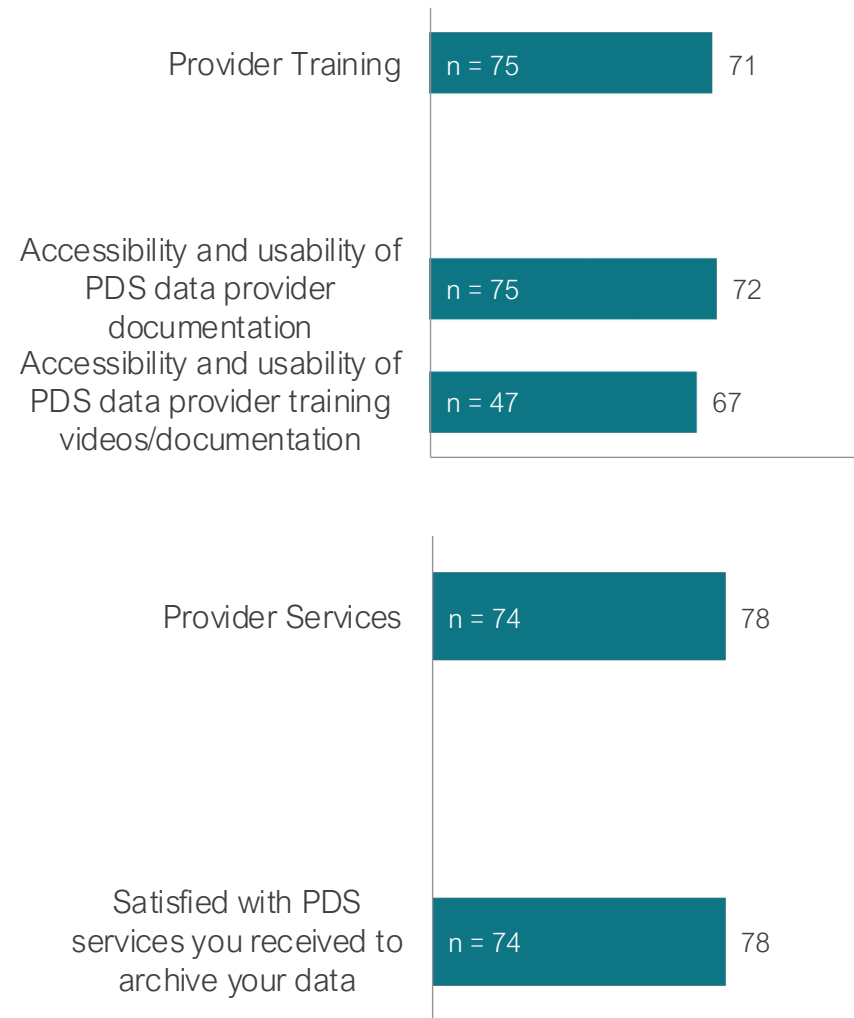
- Respondent found the documentation and training to be generally accessible, complete and accurate.

Provider Archiving Scores



- While respondents had an overall positive experience creating their PDS archive (76) they were less satisfied with the usability of the PDS data provider archiving software (64).

Provider Training and Service Scores



- Provider Services was the highest rated satisfaction driver in the NASA PDS satisfaction model.

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Appendix

User Type – Score Table

	Data User		Data Provider	
	Score	Sample Size	Score	Sample Size
Sample Size	191	191	88	88
Data User Search	63	175	63	68
PDS web services and search tools for finding data	63	175	63	68
Data User Accessibility	61	178	61	71
PDS data delivery interfaces/protocols for downloading/retrieving data	67	171	66	69
Ease of understanding and interpreting PDS data and metadata by humans	59	176	56	71
Accessibility and interoperability of PDS data products with existing software	60	160	59	65
Accessibility, completeness, and accuracy of PDS training videos/documentation	62	118	58	43
Data User Customer Service	74	99	78	41
Usefulness of PDS Customer Service	74	99	78	41
Data User Data Archive	75	175	77	71
Satisfied with the data archives provided by PDS	75	175	77	71
Data User Services	72	172	74	70
Satisfied with the services provided by PDS	72	172	74	70
Data User Documentation and Training	67	173	68	69
Satisfied with the documentation and training materials provided by PDS	67	155	67	65
Accessibility, completeness, and accuracy of PDS archive documentation	68	167	69	69
Provider Archiving	71	68	71	81
Experience working with PDS to create your PDS archive	75	64	76	77
Usability of PDS data provider archiving software tools	62	54	64	67

User Type – Score Table (cont'd)

	Data User		Data Provider	
	Score	Sample Size	Score	Sample Size
Sample Size	191	191	88	88
Provider Training	69	62	71	75
Accessibility and usability of PDS data provider documentation	71	62	72	75
Accessibility and usability of PDS data provider training videos/documentation	64	38	67	47
Provider Services	78	60	78	74
Satisfied with PDS services you received to archive your data	78	60	78	74
Customer Satisfaction Index	63	191	67	88
Overall satisfaction	70	190	75	87
Compared to expectations	60	187	63	87
Compared to ideal	58	190	60	87
Recommend	81	174	86	81
Likelihood of recommending PDS to a colleague	81	174	86	81
Future Use	87	183	90	86
Likelihood of using services provided by PDS in the future	87	183	90	86
Future Use - Provider Archiving	93	69	92	82
Likelihood to archive with PDS in the future	93	69	92	82

Appendix - Demographics

Data Category~	2022		
	Percent	Frequency	Satisfaction
Data User	93%	191	63
Data Provider	43%	88	67
Number of Respondents		206	
Operating System			
Android	5%	11	59
iPhone	3%	8	85
Linux	9%	21	67
Macintosh	33%	76	58
Windows NT	49%	113	64
Number of Respondents		229	
Country			
Australia	0%	1	100
Bangladesh	0%	1	92
Belgium	0%	1	78
Canada	3%	6	55
China	0%	1	96
France	1%	3	68
Germany	0%	1	68
Greece	0%	1	52
India	4%	10	84
Italy	3%	7	70
Japan	0%	1	86
Malaysia	0%	1	97
Netherlands	1%	2	51
Portugal	0%	1	60
Spain	2%	4	79
Sweden	0%	1	49
Ukraine	0%	1	93
United Kingdom of Great Britain and Northern Ireland	1%	3	65
United States of America	80%	183	60
Number of Respondents		229	

Appendix - Demographics

	Percent	2022 Frequency	Satisfaction
Country - USA vs All Others			
USA	80%	183	60
All Others	20%	46	73
Number of Respondents		229	
Type of user~~			
General Public	10%	22	64
Teacher: Elementary, Middle, High School	0%	1	86
Teacher: College	4%	9	58
Student: Elementary, Middle, High School	0%	1	45
Student: Undergraduate, Graduate	6%	13	65
Researcher: Planetary Scientist	51%	116	60
Researcher: Non-Planetary Scientist	6%	13	66
Citizen Scientist	7%	16	80
Mission Design	4%	9	67
Mission Team Member: Science	24%	54	63
Mission Team Member: Engineering	18%	42	72
Software Developer	15%	35	67
Visualization/Graphic Design Artist	2%	5	59
Education/Outreach	7%	17	66
Communications/Media	3%	6	74
I self-identify as early career	15%	35	54
I self-identify as mid to late career	31%	72	62
Other	10%	22	71
Number of Respondents		229	
Experience Level			
Little experience	20%	46	63
Moderate experience	40%	92	68
Extensive experience	24%	56	64
No experience	15%	35	47
Number of Respondents		229	

Appendix - Demographics

	Percent	2022 Frequency	Satisfaction
Research areas or disciplines use PDS science data or services~~			
Planetary atmospheres and exospheres	27%	57	64
Small bodies atmospheres and exospheres	12%	25	62
Exobiology	3%	6	71
Planetary surfaces including geology and geophysics	50%	107	61
Planetary geochemistry	13%	27	68
Planetary interiors	8%	17	69
Planetary magnetospheres, ionospheres, and plasmas	14%	30	67
Comets	13%	29	66
Asteroids including NEOs	22%	48	66
Oceans	6%	12	71
Space geodesy	7%	16	72
The Earth's Moon	33%	72	66
Planetary rings	9%	20	80
Planetary system dynamics and formation	6%	12	77
Orbits and astrometry	20%	42	63
Exoplanets	9%	20	75
Laboratory research	9%	20	71
Field measurements	6%	12	66
Ground-based observations	19%	41	62
Other	10%	21	49
Number of Respondents		215	
Use data from other non-planetary NASA missions in your research~~			
Astrophysics	18%	40	66
Biology	3%	7	74
Earth	25%	55	65
Heliophysics	11%	25	70
Human Exploration	19%	42	72
Other	4%	8	82
I do not use data from non-planetary NASA missions	47%	103	60
Number of Respondents		218	

Appendix - Demographics

		2022	
	Percent	Frequency	Satisfaction
User - PDS Search tools used to find planetary mission data~~			
Analyst's Notebook (AN)	21%	37	68
Cartography and Imaging Sciences Node Annex	21%	37	67
Orbital Data Explorer (ODE)	34%	59	65
Outer Planets Unified Search (OPUS)	16%	28	66
Photojournal	25%	43	70
Planetary Image Atlas	32%	56	66
Planetary Image Locator Tool (PILOT)	21%	37	69
pds.nasa.gov/datasearch/data-search	29%	51	65
pds.nasa.gov/datasearch/keyword-search	28%	49	66
Small Bodies Data Ferret	13%	22	64
Small Bodies Mapping Tool	17%	30	66
Spectral Library	8%	14	73
Viewmaster	5%	9	71
Other	13%	23	49
Number of Respondents		174	
User - Other Search tools used to find planetary mission data~~			
Autoplot	5%	7	87
Bing	8%	10	75
Digit	4%	5	86
FLOW	2%	3	96
Google	72%	96	63
JMARS tools	33%	44	61
Lunar Quickmap	32%	42	70
VISTA	5%	6	88
Other	8%	10	63
Number of Respondents		133	

Appendix - Demographics

	Percent	2022 Frequency	Satisfaction
Users - Frequency of finding data looking for			
Rarely - up to a few times per year	22%	42	52
Sometimes - up to 10 times per year	39%	74	67
Often - more than 10 times per year	39%	75	66
Number of Respondents		191	
User - Frequency of using Analysts Notebook			
Rarely - up to a few times per year	41%	15	60
Sometimes - up to 10 times per year	32%	12	66
Often - more than 10 times per year	27%	10	82
Number of Respondents		37	
User - Frequency of using Cartography and Imaging Sciences Node Annex			
Rarely - up to a few times per year	16%	6	68
Sometimes - up to 10 times per year	46%	17	69
Often - more than 10 times per year	38%	14	65
Number of Respondents		37	
User - Frequency of using Orbital Data Explorer			
Rarely - up to a few times per year	29%	17	59
Sometimes - up to 10 times per year	41%	24	68
Often - more than 10 times per year	29%	17	66
Number of Respondents		58	
User - Frequency of using Outer Planets Unified Search			
Rarely - up to a few times per year	37%	10	62
Sometimes - up to 10 times per year	33%	9	56
Often - more than 10 times per year	30%	8	82
Number of Respondents		27	

Appendix - Demographics

	Percent	2022 Frequency	Satisfaction
User - Frequency of using Photojournal			
Rarely - up to a few times per year	37%	16	70
Sometimes - up to 10 times per year	35%	15	75
Often - more than 10 times per year	28%	12	64
Number of Respondents		43	
User - Frequency of using Planetary Image Atlas			
Rarely - up to a few times per year	33%	18	57
Sometimes - up to 10 times per year	48%	26	70
Often - more than 10 times per year	19%	10	71
Number of Respondents		54	
User - Frequency of using Planetary Image Locator Tool			
Rarely - up to a few times per year	35%	13	63
Sometimes - up to 10 times per year	41%	15	70
Often - more than 10 times per year	24%	9	75
Number of Respondents		37	
User - Frequency of using pdsnasagovdatasearchdata-search			
Rarely - up to a few times per year	37%	18	65
Sometimes - up to 10 times per year	43%	21	65
Often - more than 10 times per year	20%	10	67
Number of Respondents		49	
User - Frequency of using pdsnasagovdatasearchkeyword-search			
Rarely - up to a few times per year	28%	13	62
Sometimes - up to 10 times per year	53%	25	72
Often - more than 10 times per year	19%	9	56
Number of Respondents		47	

Appendix - Demographics

	Percent	2022 Frequency	Satisfaction
User - Frequency of using Small Bodies Data Ferret			
Rarely - up to a few times per year	50%	11	61
Sometimes - up to 10 times per year	18%	4	57
Often - more than 10 times per year	32%	7	73
Number of Respondents		22	
User - Frequency of using Small Bodies Mapping Tool			
Rarely - up to a few times per year	46%	13	63
Sometimes - up to 10 times per year	32%	9	70
Often - more than 10 times per year	21%	6	71
Number of Respondents		28	
User - Frequency of using Spectral Library			
Rarely - up to a few times per year	36%	5	60
Sometimes - up to 10 times per year	21%	3	84
Often - more than 10 times per year	43%	6	79
Number of Respondents		14	
User - Frequency of using Viewmaster			
Rarely - up to a few times per year	11%	1	71
Sometimes - up to 10 times per year	33%	3	56
Often - more than 10 times per year	56%	5	80
Number of Respondents		9	
User - Frequency of using Other PDS Tools			
Rarely - up to a few times per year	32%	7	38
Sometimes - up to 10 times per year	18%	4	56
Often - more than 10 times per year	50%	11	55
Number of Respondents		22	

Appendix - Demographics

	Percent	2022 Frequency	Satisfaction
User - Frequency of using Autoplot			
Rarely - up to a few times per year	43%	3	82
Sometimes - up to 10 times per year	29%	2	84
Often - more than 10 times per year	29%	2	96
Number of Respondents		7	
User - Frequency of using Bing			
Rarely - up to a few times per year	40%	4	89
Often - more than 10 times per year	60%	6	66
Number of Respondents		10	
User - Frequency of using Digit			
Rarely - up to a few times per year	40%	2	83
Sometimes - up to 10 times per year	20%	1	71
Often - more than 10 times per year	40%	2	96
Number of Respondents		5	
User - Frequency of using FLOW			
Rarely - up to a few times per year	33%	1	97
Sometimes - up to 10 times per year	33%	1	100
Often - more than 10 times per year	33%	1	92
Number of Respondents		3	
User - Frequency of using Google			
Rarely - up to a few times per year	8%	8	76
Sometimes - up to 10 times per year	22%	21	63
Often - more than 10 times per year	69%	66	62
Number of Respondents		95	

Appendix - Demographics

		2022	
	Percent	Frequency	Satisfaction
User - Frequency of using JMARS tools			
Rarely - up to a few times per year	27%	12	61
Sometimes - up to 10 times per year	39%	17	62
Often - more than 10 times per year	34%	15	59
Number of Respondents		44	
User - Frequency of using Lunar Quickmap			
Rarely - up to a few times per year	31%	13	68
Sometimes - up to 10 times per year	33%	14	72
Often - more than 10 times per year	36%	15	69
Number of Respondents		42	
User - Frequency of using VISTA			
Rarely - up to a few times per year	33%	2	72
Sometimes - up to 10 times per year	33%	2	95
Often - more than 10 times per year	33%	2	96
Number of Respondents		6	
User - Frequency of using Other Tools			
Rarely - up to a few times per year	30%	3	61
Sometimes - up to 10 times per year	20%	2	42
Often - more than 10 times per year	50%	5	72
Number of Respondents		10	
Users - Types of software tools~~			
PDS Supplied Tools	49%	93	66
Commercial Tools	54%	103	62
Open Source Tools	43%	83	64
User-Developed Tools	49%	93	61
None of the above	16%	30	64
Number of Respondents		191	

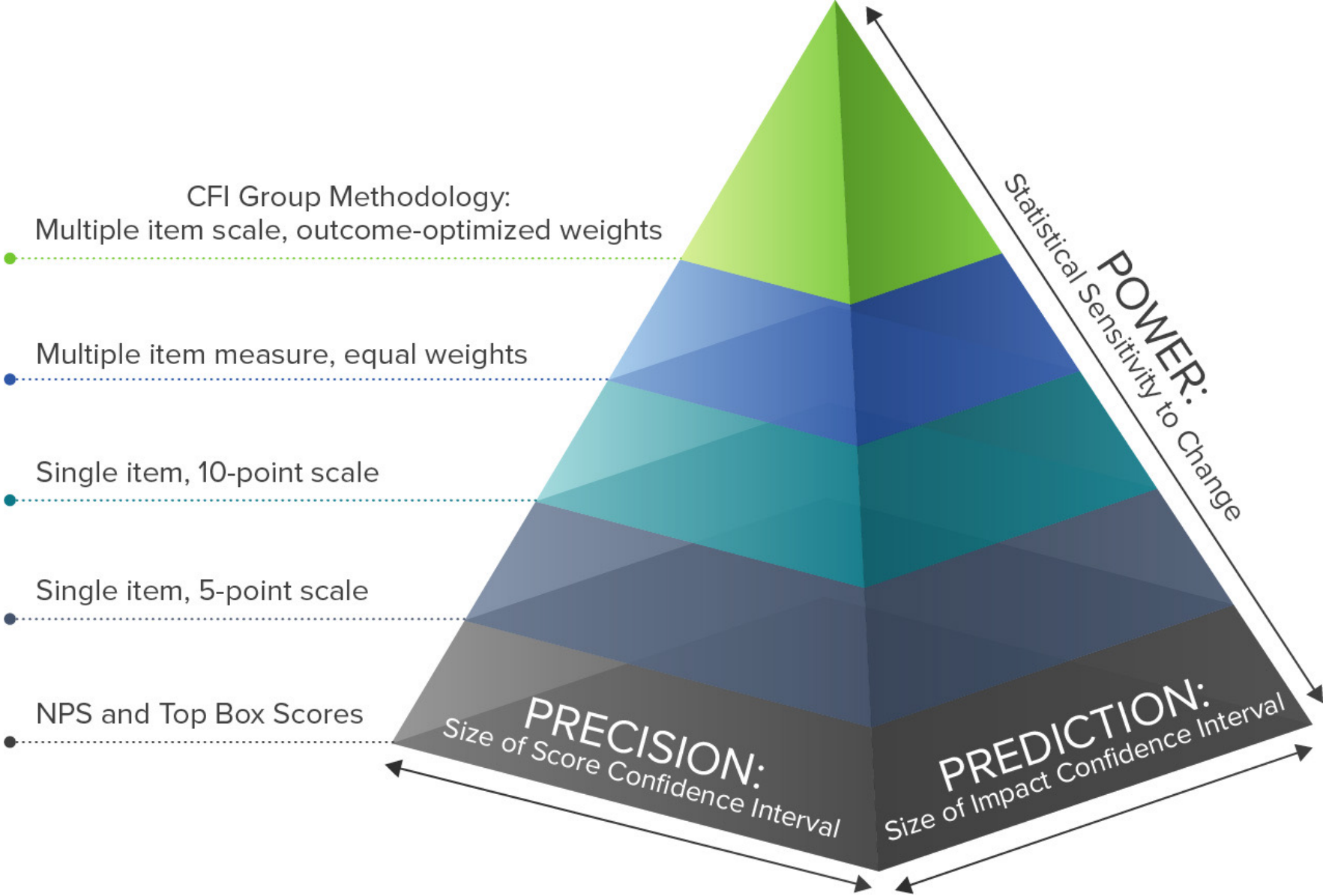
Appendix - Demographics

	Percent	2022 Frequency	Satisfaction
Provider - Types of software tools~~			
PDS Tools	44%	38	68
Commercial Tools	13%	11	63
Open Source Tools	17%	15	75
User Developed Tools	57%	49	66
None of the above	28%	24	69
Number of Respondents		86	
Need for instrument teams to archive their software			
Yes, as part of PDS Archive	41%	94	61
Yes, though not part of a PDS Archive	22%	50	64
No	7%	16	72
I don't know	30%	68	63
Number of Respondents		228	
Need to archive scientific models			
Yes, as part of PDS Archive	37%	85	63
Yes, though not part of a PDS Archive	26%	58	62
No	10%	23	63
I don't know	27%	61	62
Number of Respondents		227	
Need to archive spacecraft engineering data			
Yes, as part of PDS Archive	52%	118	62
Yes, though not part of a PDS Archive	16%	36	64
No	7%	15	74
I don't know	26%	58	60
Number of Respondents		227	

Appendix - Demographics

	Percent	2022 Frequency	Satisfaction
Require high end computing			
Yes	45%	102	66
No	49%	112	60
I don't know	7%	15	61
Number of Respondents		229	
Likely to use machine learning techniques			
Yes	39%	89	65
No	42%	96	62
I don't know	19%	44	61
Number of Respondents		229	

The Measurement Pyramid



Thank you

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