



Exploring the Geoscience Data Management Landscape

Opportunities to Optimize Business
Performance by Empowering Geoscientists

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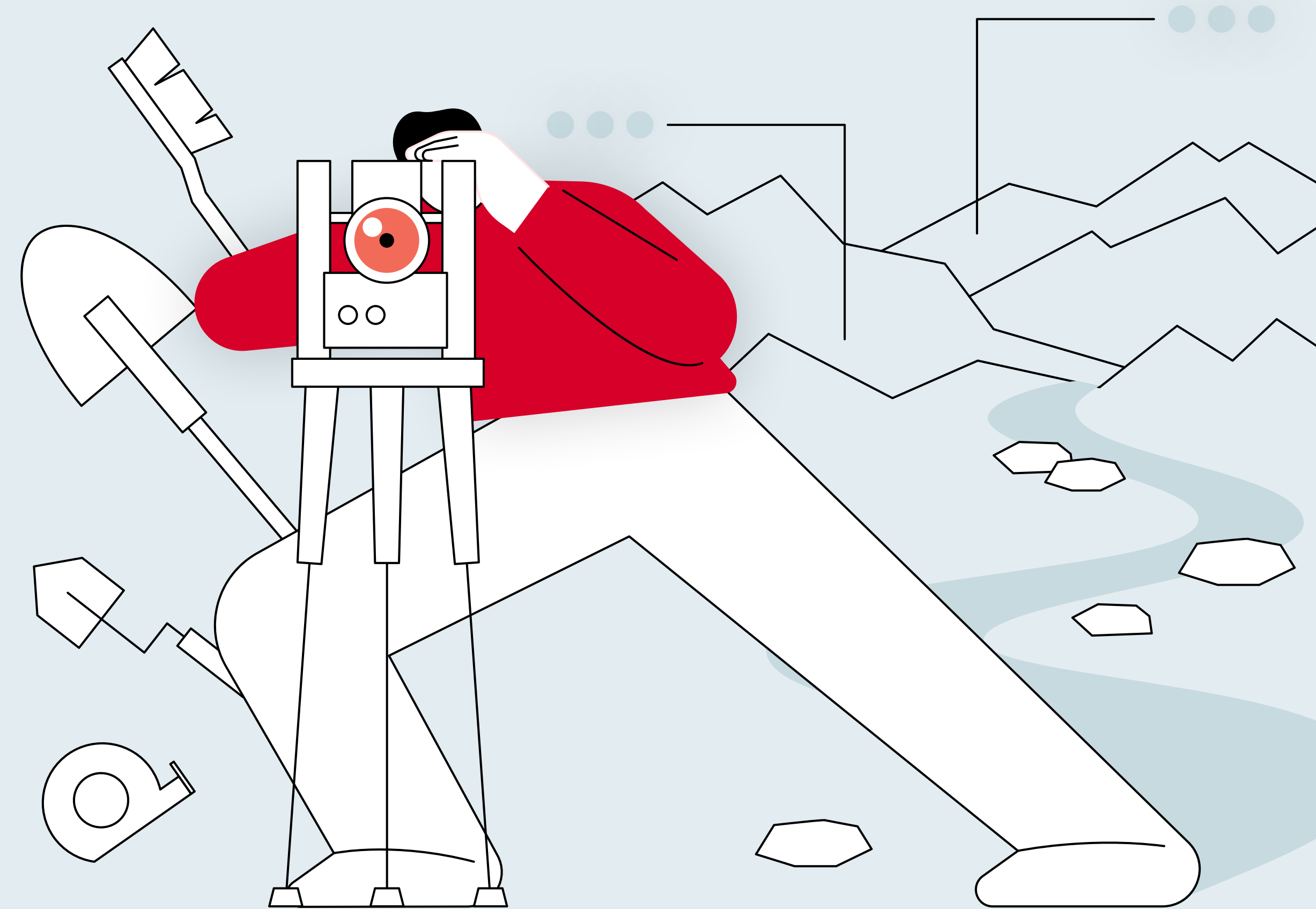
Introduction

Data management is one of the critical success factors of upstream business. Geology and Geophysics (G&G) professionals leverage multiple geo applications for various functions, such as project management, mapping, interpretation, statistics, geo-modeling, geochemistry, and geo-steering. Within these applications, they inevitably work with a multitude of data. They often struggle to keep their data in sync and free from errors, avoiding quality issues, while distinguishing raw data from interpreted data and ascertaining which sources are most trusted.

Challenges arise because applications are difficult to integrate. They require inefficient, manual data movements. Data types are complex and unstandardized, and data is often inherited through M&A activity. These issues often result in longer project timelines and poor utilization of scarce resources (made all the more acute by current skills gaps across the industry). The impact of delayed results from analyzed data has a ripple effect on the total cost of expensive E&P operations.

This IDC InfoBrief presents the viewpoints of senior G&G leaders, data managers, and technical data users throughout Europe and North America, collected in **50 interviews**. It outlines their hands-on experience, day-to-day data challenges, and future aspirations in terms of subsurface data management across the following three broad categories:

- 1. The Current State of Subsurface Geology and Geophysics Data Management at E&P Organizations**
- 2. Creating a Data Strategy by Addressing the Fundamentals — How G&G Data Users Would Like to See the Situation Change in the Future**
- 3. Transitioning from the Present to the Desired Future State**



Executive Summary

As most E&P organizations face the challenge of managing fast-paced, ever-expanding volumes of G&G data (of various upstream O&G data sources and formats), they must ensure effective analysis and operationalization of their data wealth. **E&P organizations are increasingly recognizing the need to update or acquire new advanced data management solutions.** Many have realized that — with the increasing pace of data growth, new collaborative ways of working, and the needs of rapid and robust data visualization — their existing legacy data management tools and applications may not be advantageous or effective in supporting the dynamic requirements of G&G data users.



Over **60%** of G&G professionals expect huge data growth, ranging between **15% and 49%** in the next two years.



44% of E&P companies will likely be increasing their spending on upstream data management over the next two years. **No E&P company interviewed for this study indicated any plans to decrease their data management spending** during the same period.



Over **40%** of E&P companies would like to opt for new **software solutions** when it comes to managing growing G&G data volumes.

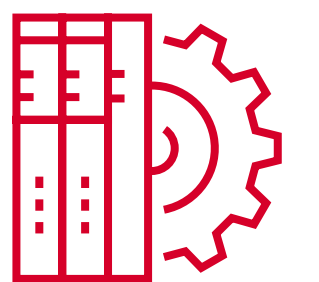


Data centralization, data quality, and data visualization are the top 3 priorities for the next couple of years when it comes to the various aspects of data management in the upstream oil and gas industry.

Over **75% of upstream companies** believe their business performance has improved as a result of investments in modernizing data management.



In just three years, the number of **organizations prioritizing data management has increased by approximately 10%.** **In 2020, over 30%** of organizations considered it a strategic priority; **in 2023, that number has risen to 40%.**





#1

The Current State of Geology and Geophysics Data Management at E&P Organizations

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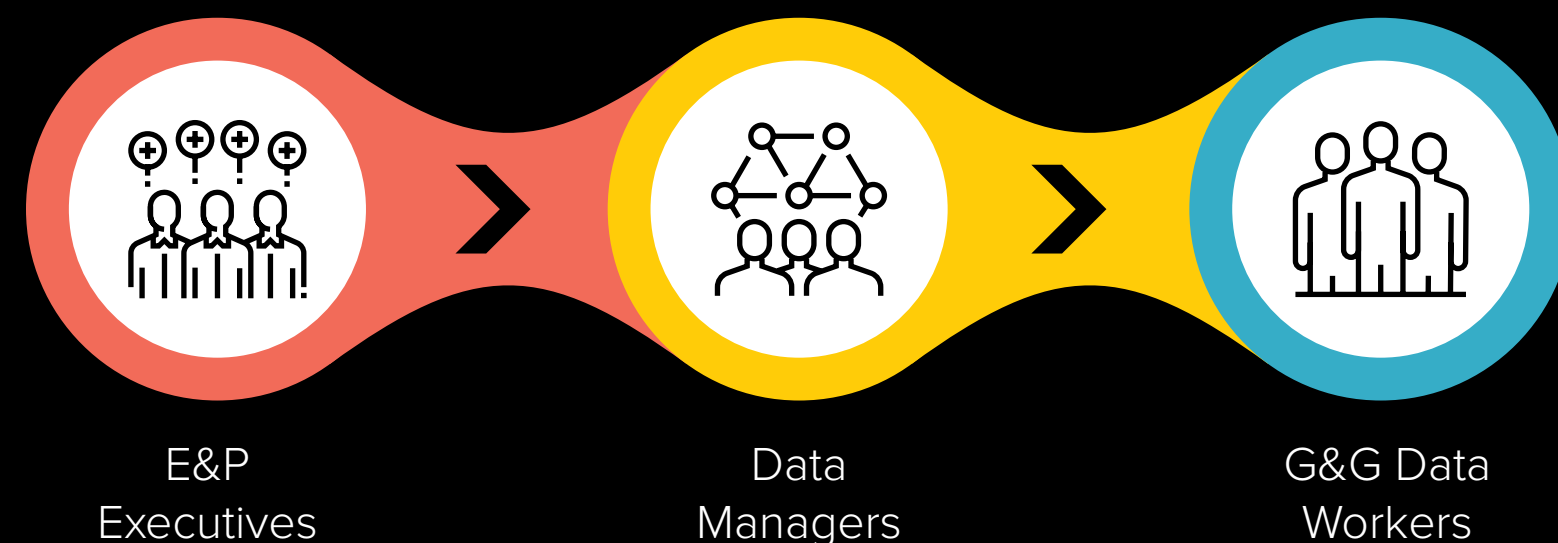


O&G Upstream Organizations: What They Want Versus How They Work Today

Amid the current unprecedented macroeconomic, environmental, and geopolitical conditions, upstream leaders are under pressure to optimize capital allocations and reduce time-to-market by doubling down on data-driven decision making. To address the energy dilemma — balancing energy security and energy transition — E&P leaders, more than ever, are scrambling to improve efficiency across the key pillars of their upstream organizations — G&G data operations, the G&G talent pool, and technology.

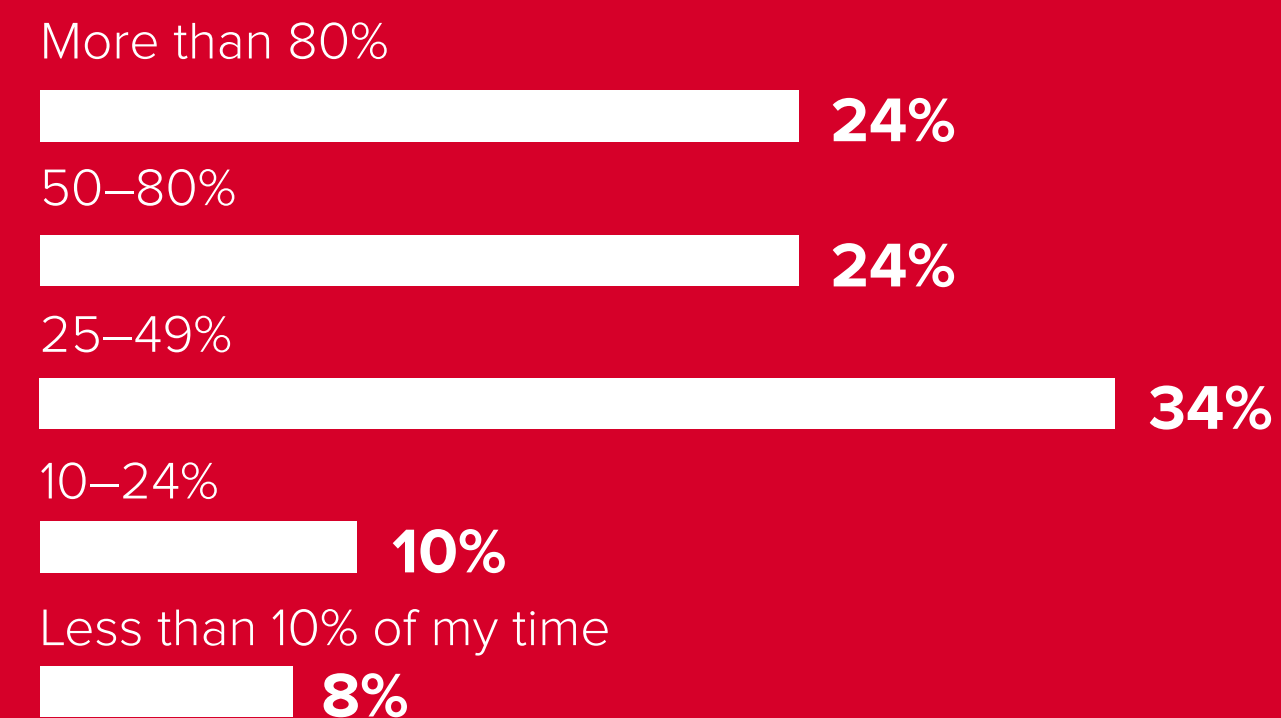
What They Want

- **E&P executives** want their organizations to be effective and efficient when it comes to leveraging data to improve exploratory success and time-to-market. **40% of senior E&P executives see data management as their strategic priority.**
- **Data managers** aim to extract the maximum value from data to improve decision-making for subsurface operations.
- **G&G data workers** are looking for new ways to optimize processes and improve efficiency in data management and analysis of large amounts of domain data.



How They Work Today

Q. How much of your own time do you spend manually collecting, checking, updating, moving, and changing data in your G&G applications?

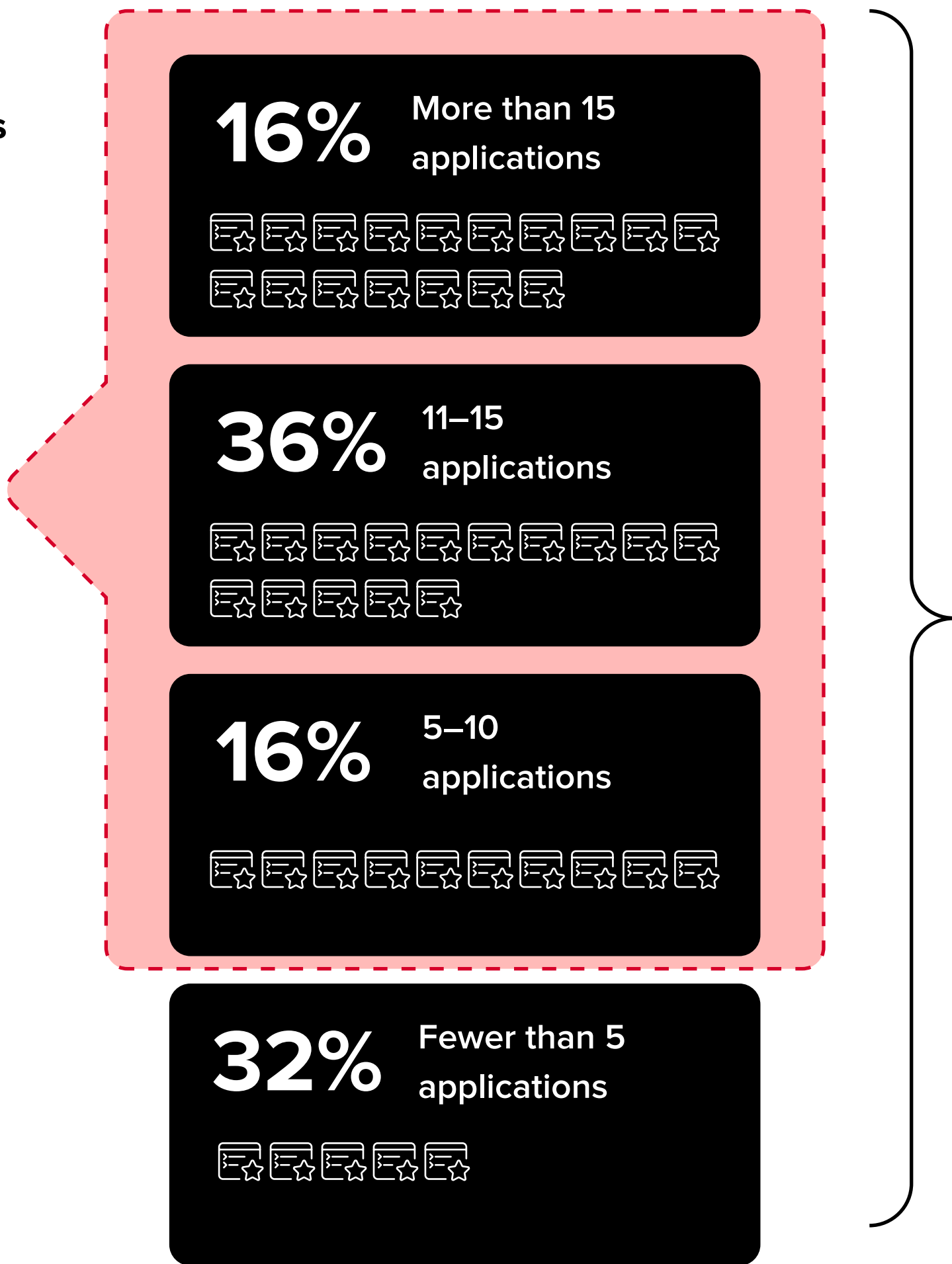
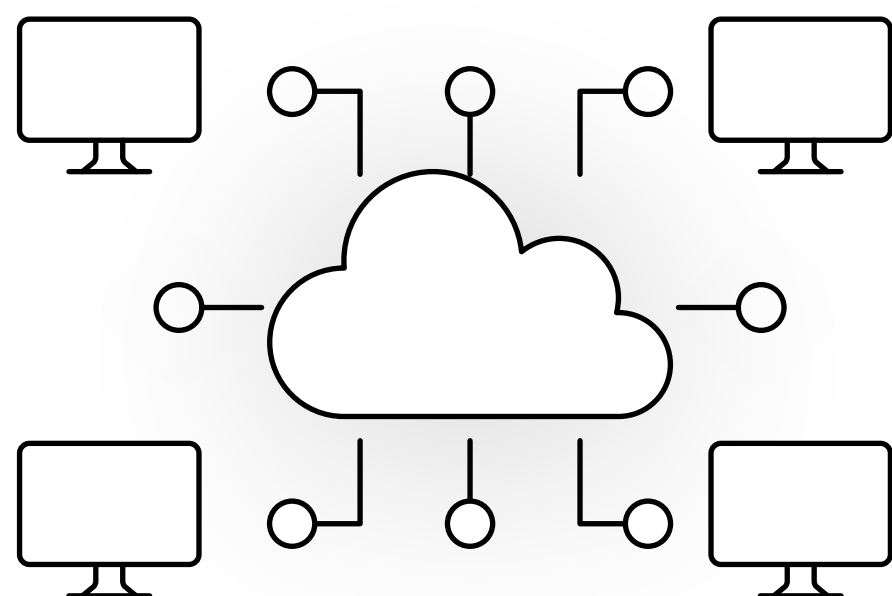


“ 1/4th of upstream data users currently spend more than 80% of their time on data handling activities. ”

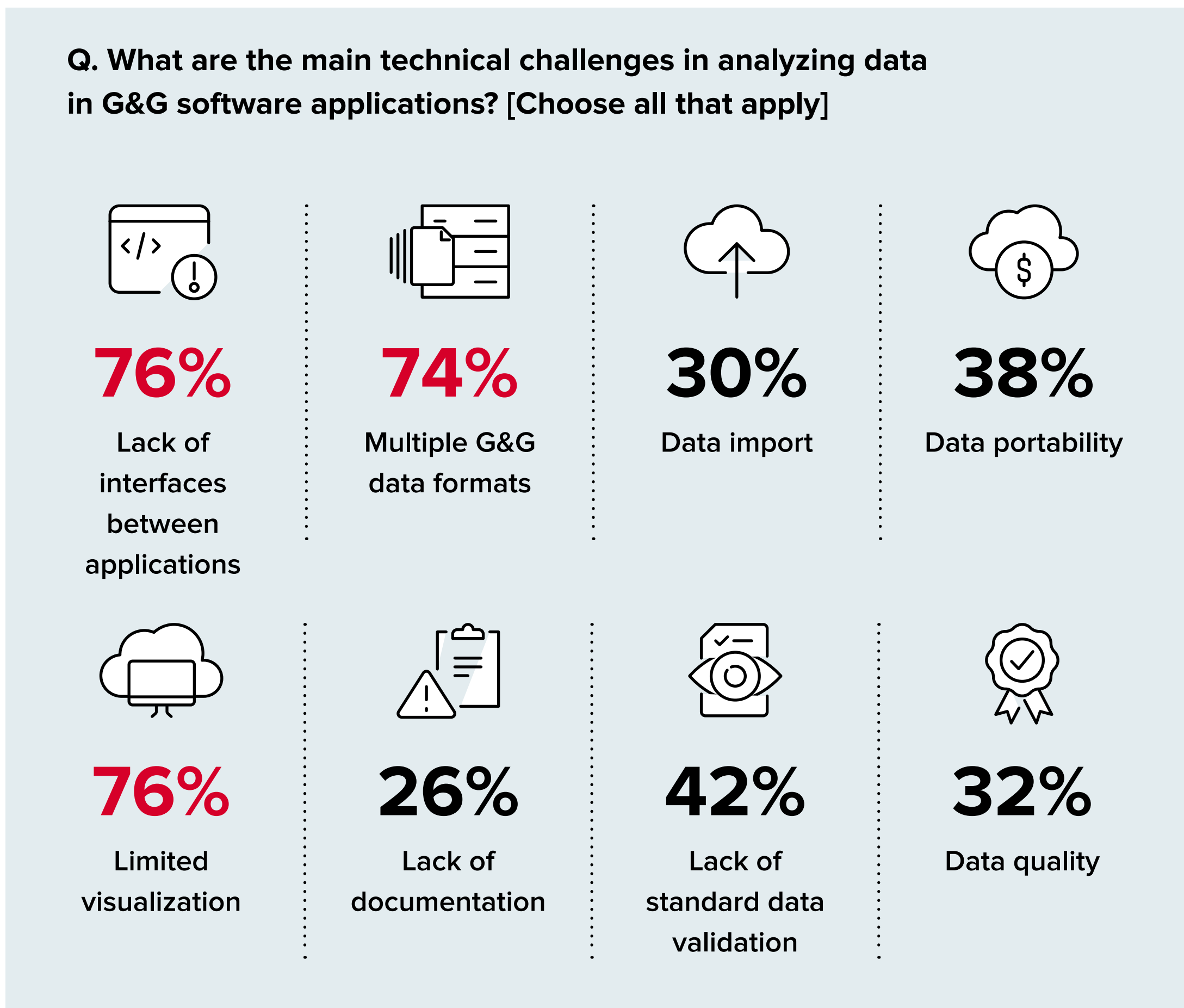
Utilizing Multiple G&G Software Applications Exacerbates Data Management Challenges

Q. How many different geology and geophysical (G&G) software applications does your organization use?

68% of upstream companies use more than 5 G&G applications, 16% of which use more than 15 applications for their day-to-day data processing, correlation, and interpretation tasks.

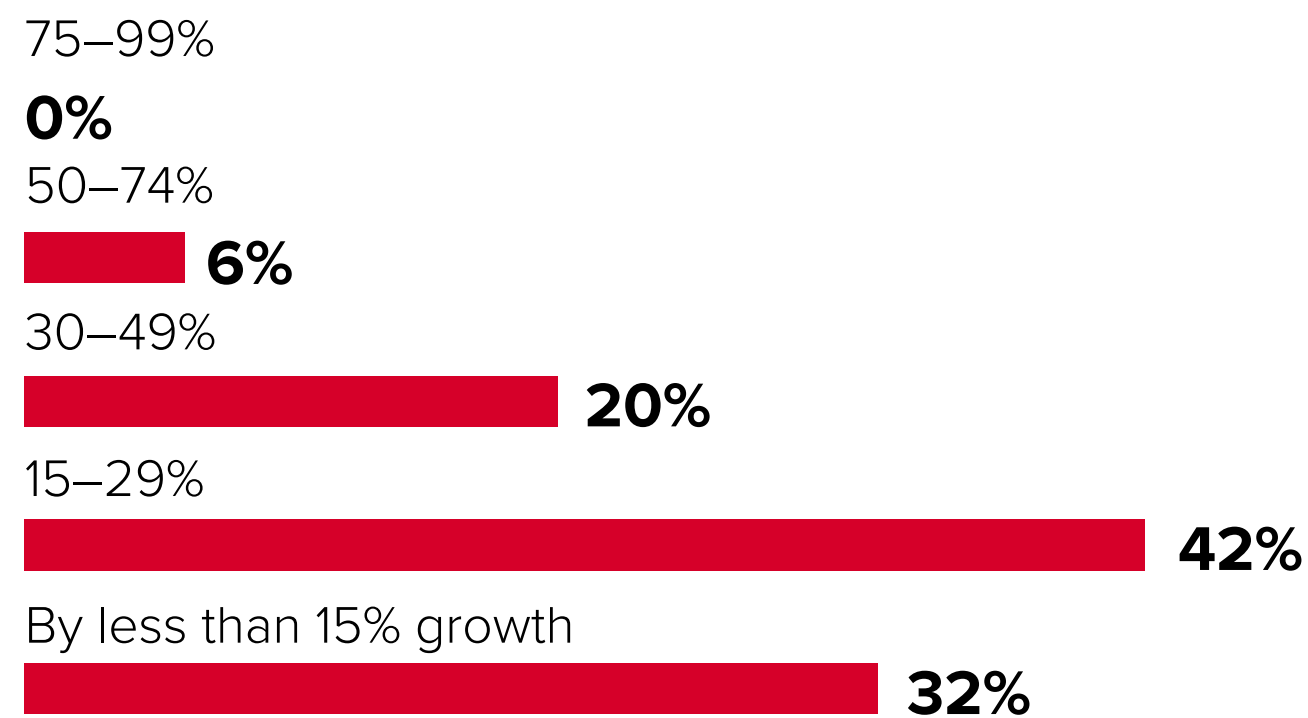


Q. What are the main technical challenges in analyzing data in G&G software applications? [Choose all that apply]



The Data Deluge Is Inevitable, But the Importance of Managing Data Efficiently Is Understood by Most Senior Managers

Q. How much do you expect your organization's annual volume of G&G data to grow over the next two years?

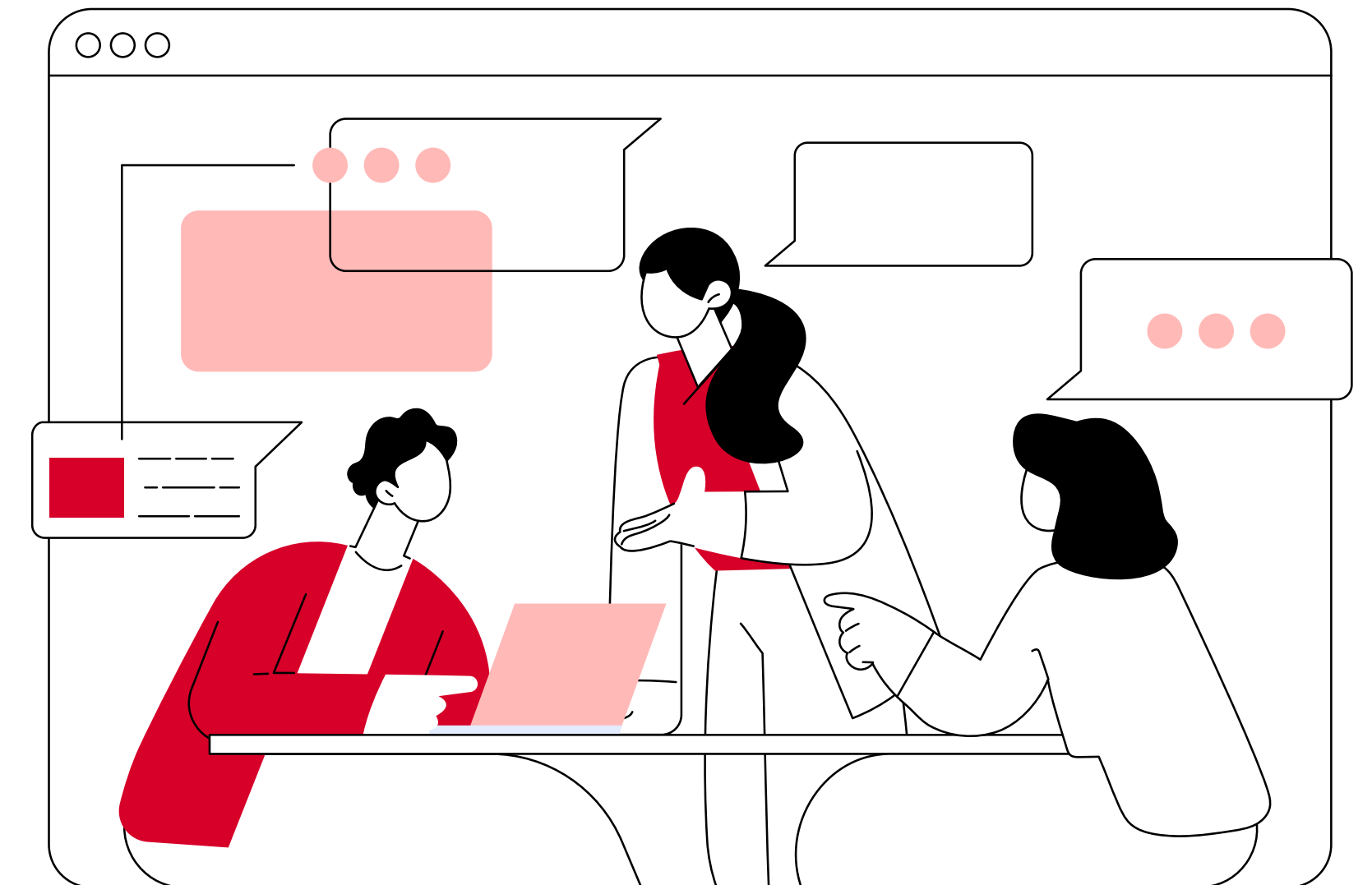


A significant increase in data is anticipated, coming from two potential sources:

1. G&G data acquisitions required to support E&P and development programs.
2. Digitalization of historic E&P data and other upstream digital transformation programs (e.g., subsurface unstructured data management).

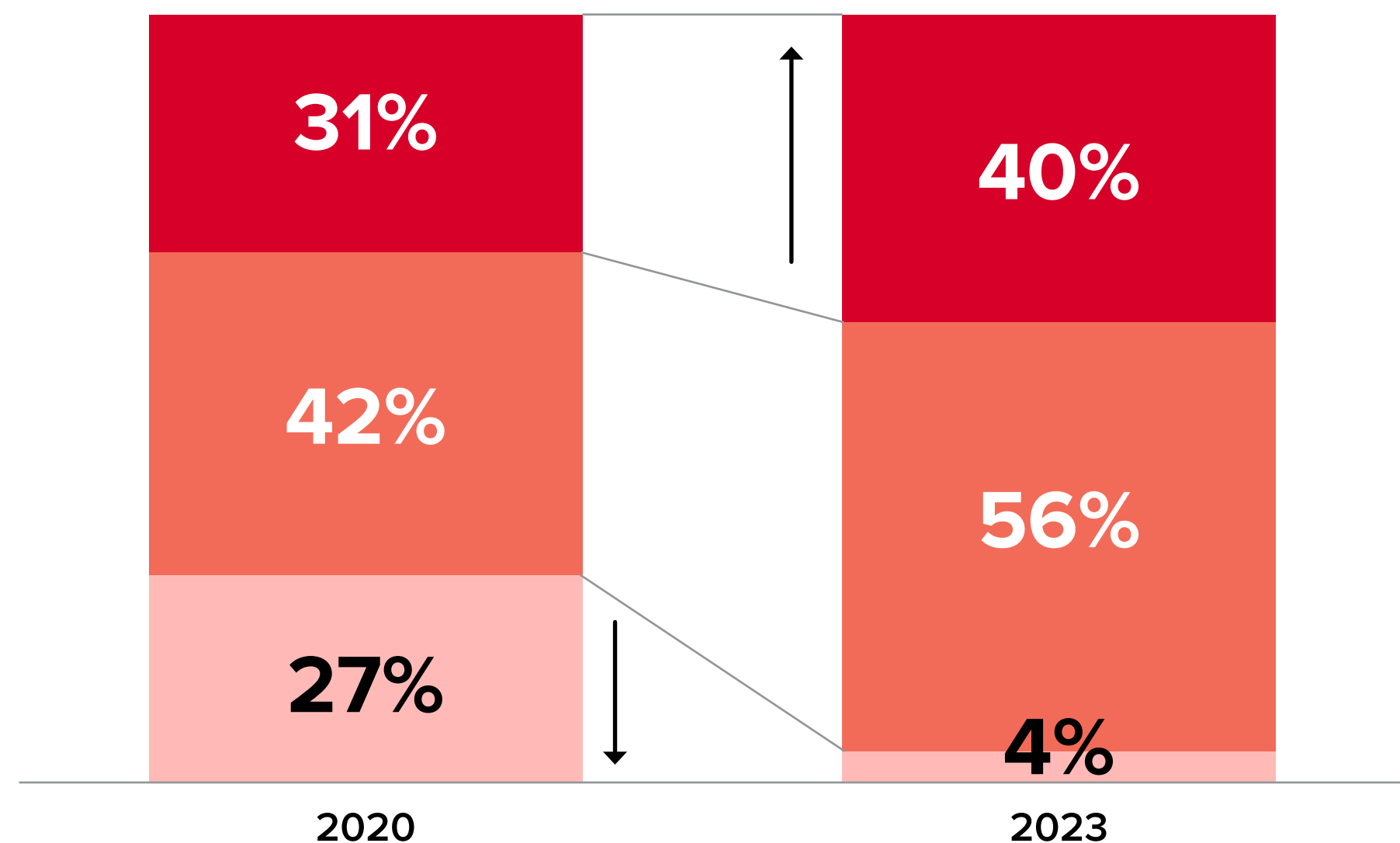
The increase in G&G data volumes and the requirement to use multiple software applications necessitate E&P operators to understand the importance and evolving needs of data management. Operators need to develop robust data management-centric capabilities to address complex data challenges and streamline their processes.

While some may feel overwhelmed by the **growing amounts of G&G data**, many see it as an opportunity to gain a competitive advantage.



The Data Deluge Is Inevitable, But the Importance of Managing Data Efficiently Is Understood by Most Senior Managers

Q. Which of the following statements best describes the importance of data management in your E&P organization?



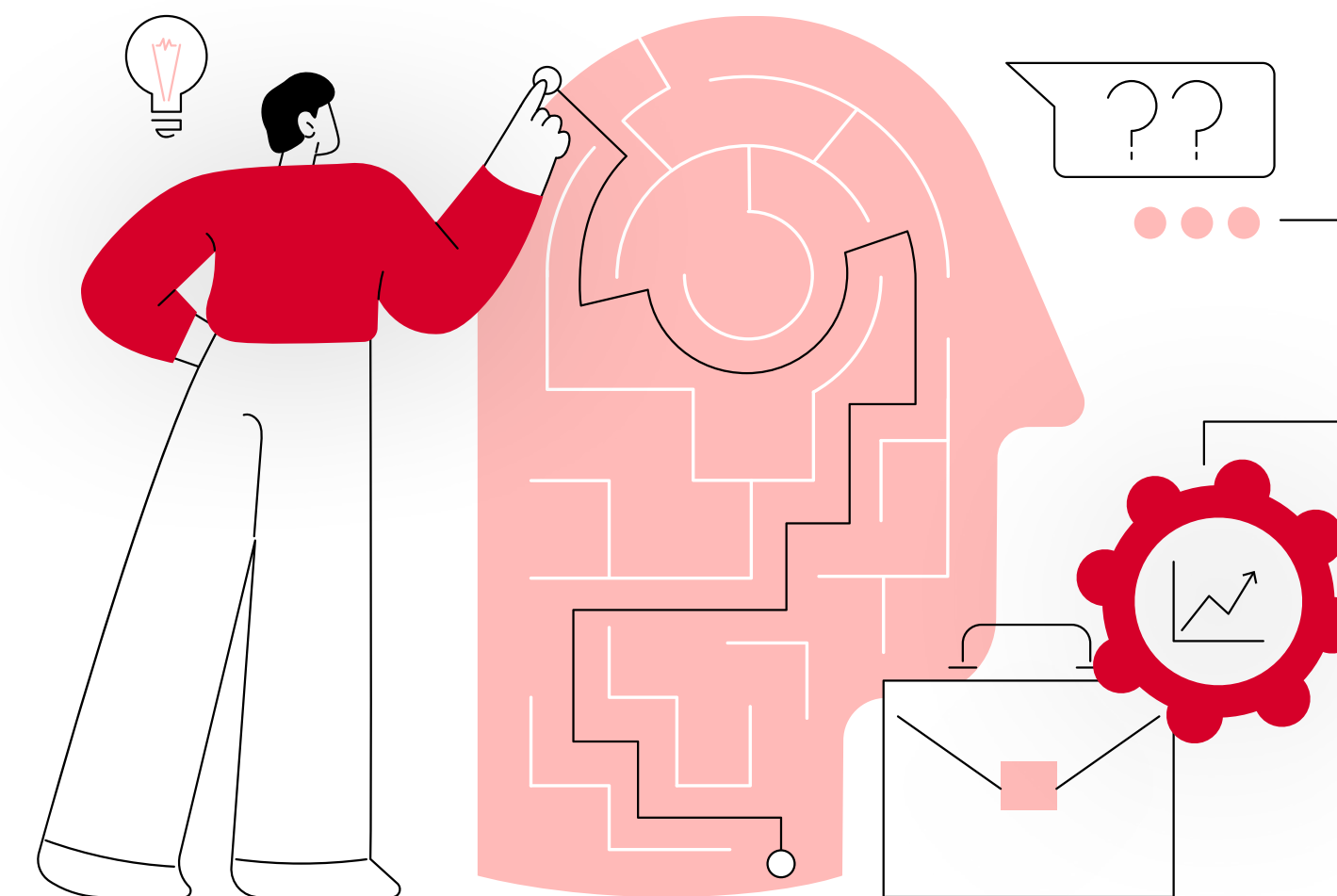
- Data management is a strategic priority for the company with support from senior management
- The importance of data management is understood by some members of senior management and the wider business
- Data management receives minimal support from senior management and the wider business



G&G data management only receives minimal support **at 4% of E&P organizations**



E&P leaders are increasingly **recognizing the value of modernizing data management**. In just **three years**, there has been an approximate **10% rise in the number of organizations** that consider **data management a strategic priority** — from over 30% in 2020 to 40% in 2023.





#2

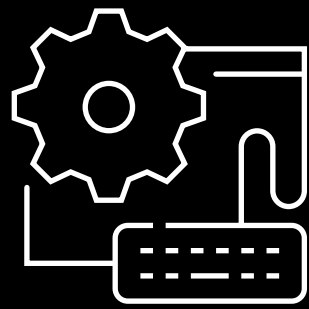
Creating a Data Strategy by Addressing the Fundamentals — How G&G Data Users Would Like to See the Situation Change in the Future

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Improvements in the Key Areas of Data Management Will Help G&G Professionals to Remain Focused on Performing Their High-Worth Tasks

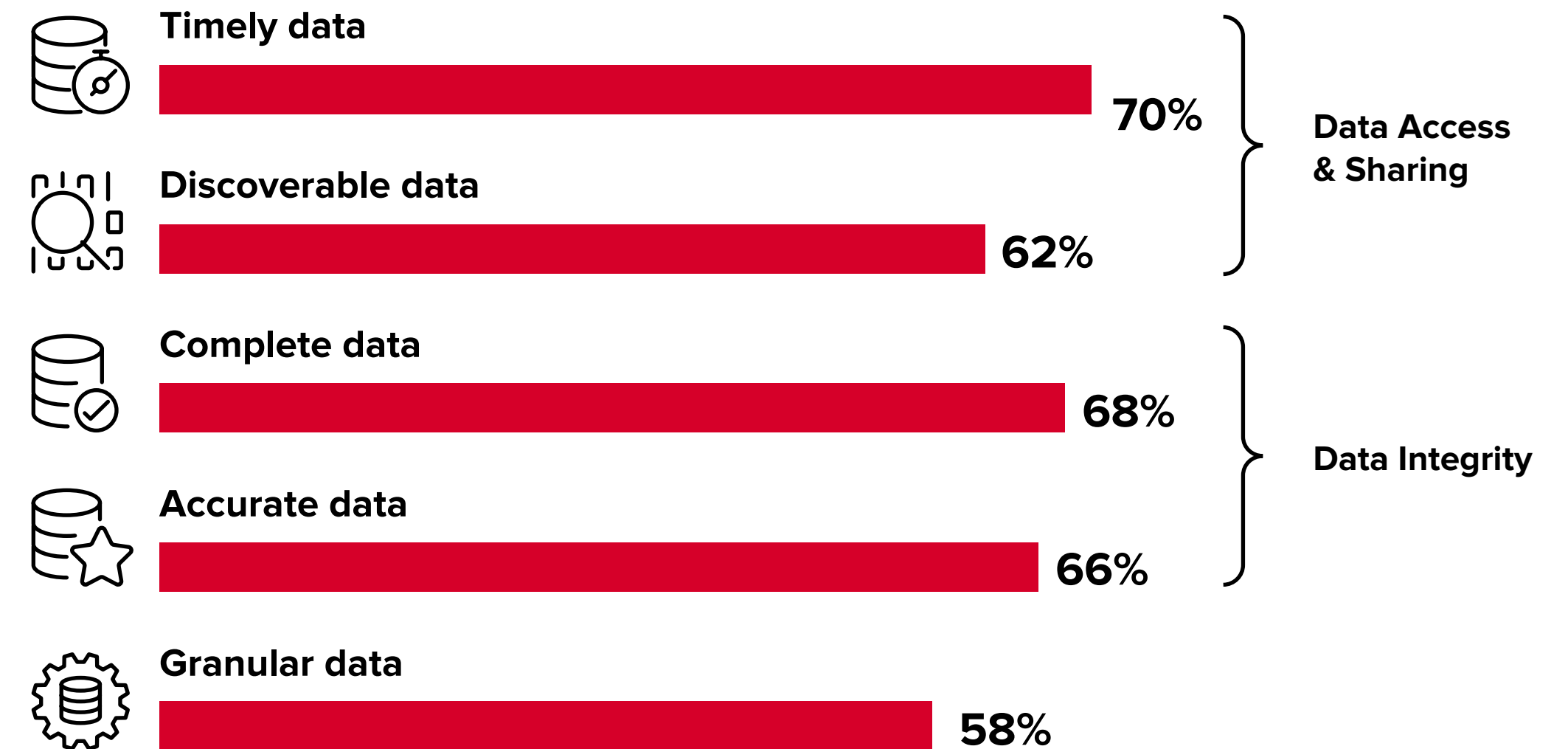


Most G&G professionals believe seamless data accessibility and sharing capabilities are critical for working efficiently on data-intensive projects with various E&P teams, departments, and external parties.

To enhance the efficacy and productivity of G&G professionals, our research shows that there are several noteworthy improvements in the data management space that E&P companies need to consider:

- Ask some fundamental questions before investing in the upkeep, advancement, or procurement of data management solutions. How will it empower G&G data users? Will it streamline time-consuming manual tasks?
- Eliminate common inefficiencies at the data preparation stage. Prioritize the completeness, granularity, timely availability, and accessibility of data, as these were the key priorities identified during interviews with geoscientists.
- Address the aspects of data management that enable geoscientists to effectively perform data interpretation and modelling while working on multiple G&G software applications (namely, support for multiple data formats, seamless interfaces between applications, and data visualization capabilities).

Q. How important are each of the following for you to be able to perform G&G data analysis effectively and efficiently?

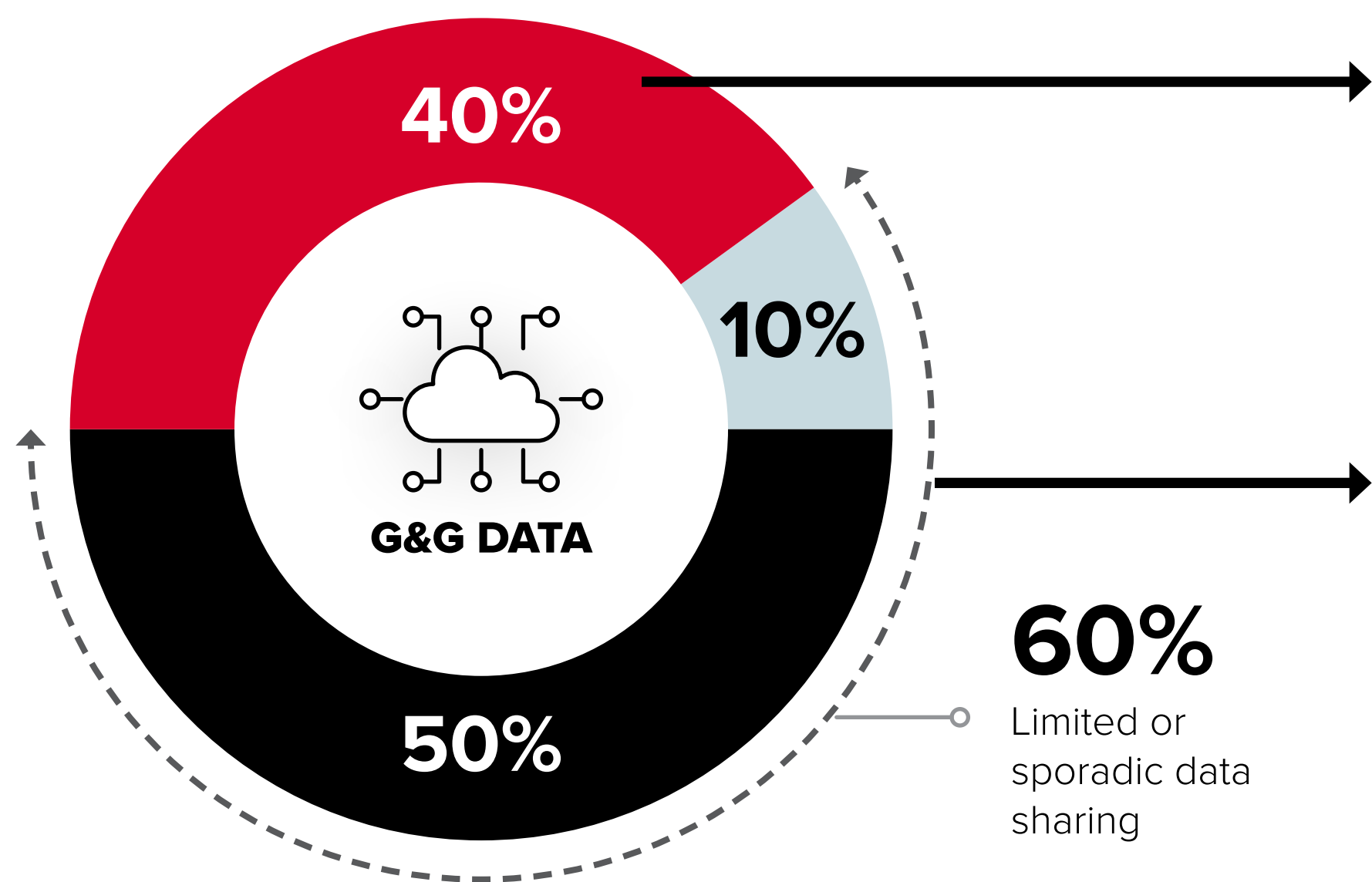


From the perspective of G&G professionals, the essential factors for successful data analysis are **timely, discoverable, complete, accurate and granular data**.

Geophysicists and Geologists Seek Improved Capabilities for Accessing and Sharing G&G Data

DATA ACCESS & SHARING

Q. Which statement best describes your organization's approach to G&G data sharing between and within its departments/teams?



● Data access limited to a single department due to issues with data privacy/security and integration

● Ad hoc manual data sharing to support specific needs or projects

● Policies, data standards, and mechanisms for data sharing exist



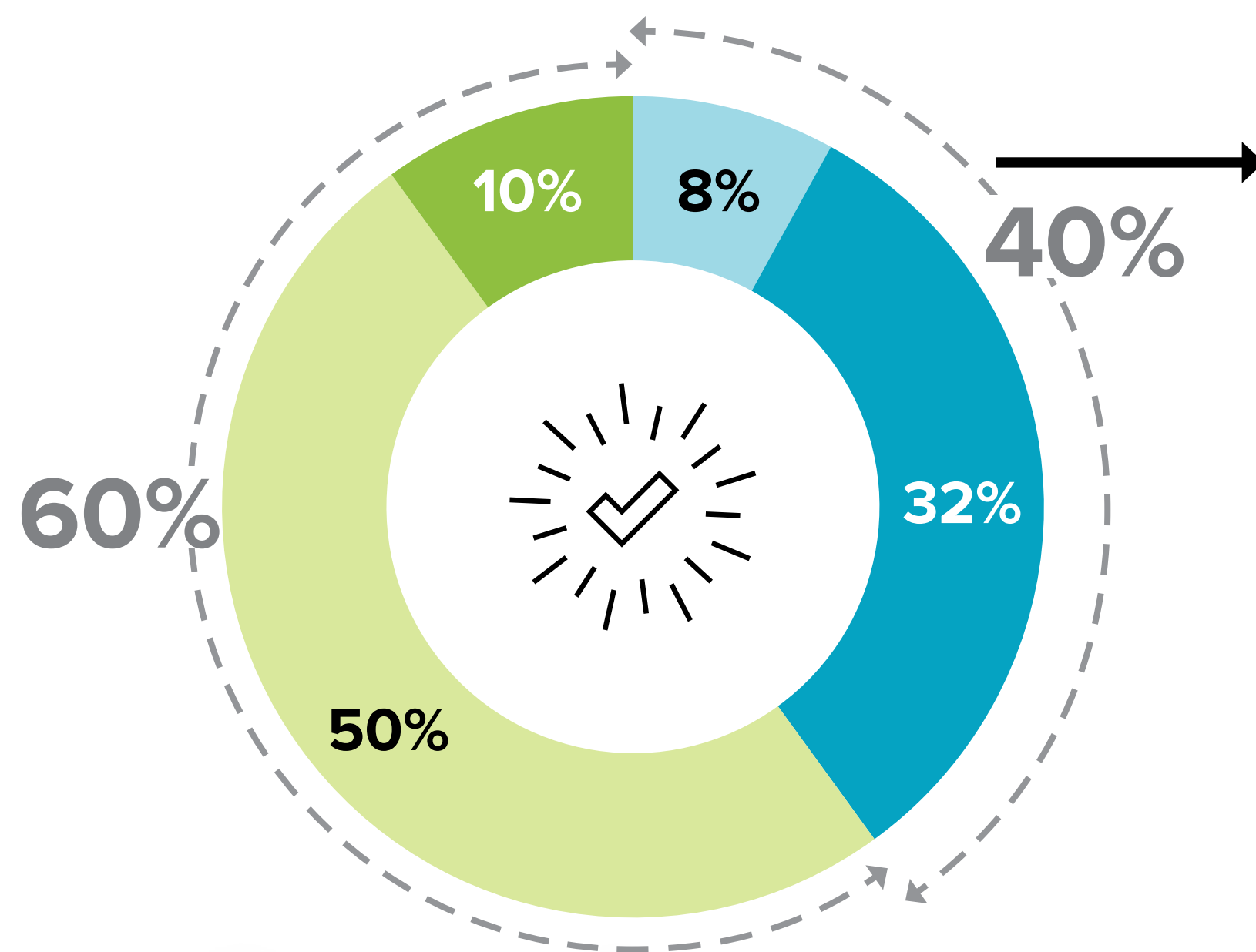
60% of upstream organizations do not have efficient data sharing capabilities among the relevant departments and teams.

Data stored in siloed systems and owned by core teams (e.g., drilling, field development, data acquisition, and reservoir engineering), as well as legacy data infrastructure, poses obstacles for sharing and accessing data. Geoscientists often need all possible sources of G&G data — including data from similar geological basins, past interpretations, petrophysical studies, and basin modeling — to refine their analysis and back up their hypotheses. Limited visibility and access capabilities impact the accuracy and reliability of data analysis. In many cases, geoscientists are unaware of useful data that exists within their organization, while others spend a significant amount of time discovering and accessing relevant data from other E&P teams. All of this adds to a deterioration in overall E&P business performance in terms of delayed drilling programs, exploratory cost overruns, and increased time-to-market, to name a few.

Data Integrity and Lineage Are Essential; Any Compromise Can Significantly Affect the Reliability of the Analysis

DATA INTEGRITY

Q. How confident are you in the integrity of data used for geology and geoscience analysis in your team?



40% of G&G data users are only slightly to moderately confident in the completeness and reliability of the data they use.

Data acquired in the field and sent to the office is then uploaded to data management systems or data repositories to be used for G&G data interpretation. Most companies do not have a robust validation process in place when loading data onto the office server or cloud. As a result, human error during the data transfer process often causes accuracy and completeness issues.

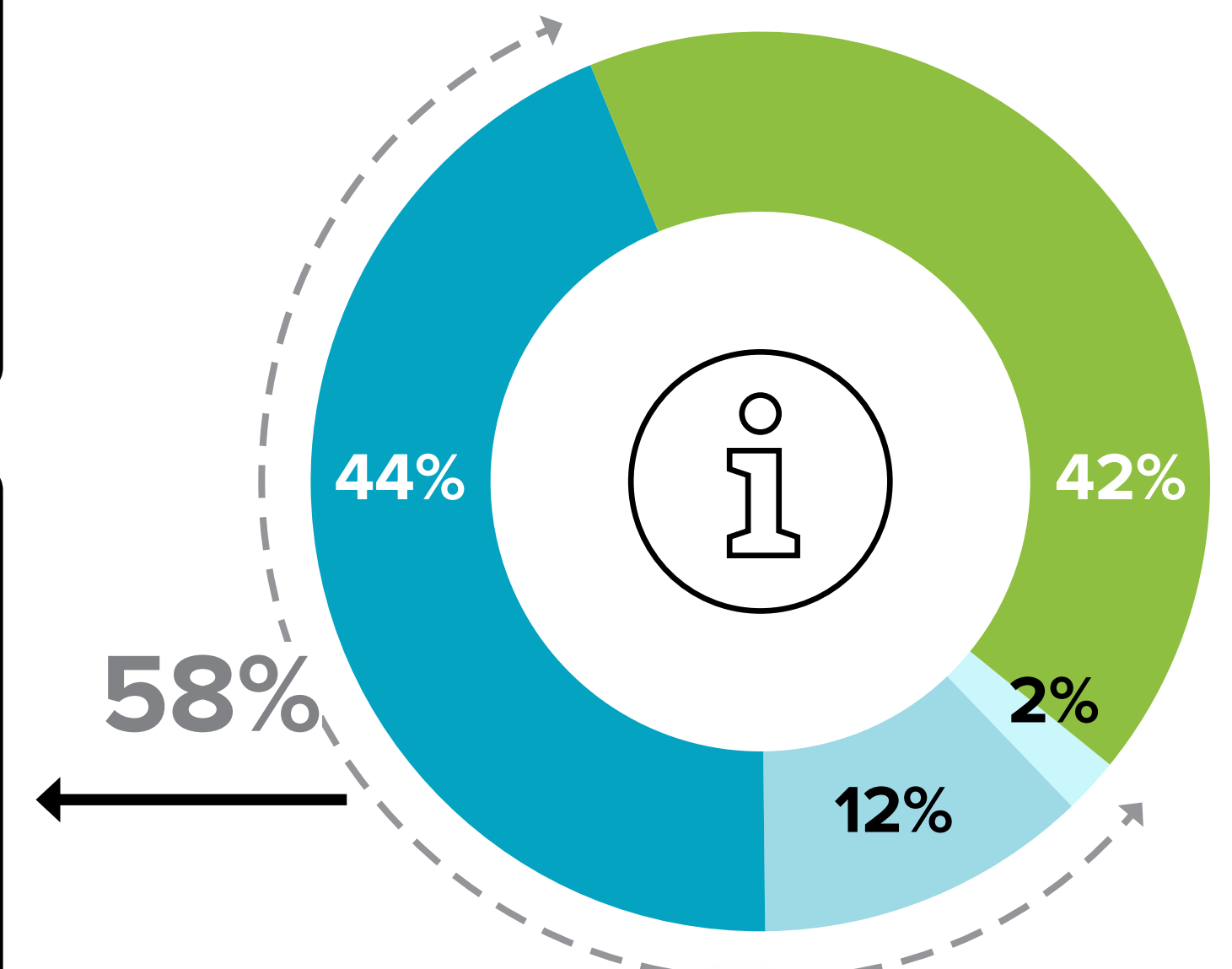
58% of G&G data users get no visibility or only partial visibility of the provenance of their data.

G&G data is complex and acquired from multiple vendors and internal sources. Visibility of data lineage is essential for ensuring users understand their data and feel confident in the accuracy of the data.

- Slightly confident
- Moderately confident
- Confident
- Very confident

DATA LINEAGE

Q. How much insight do members of the geoscience team have into data lineage (i.e., where data came from, who touched it, how it was altered, and where it went)?

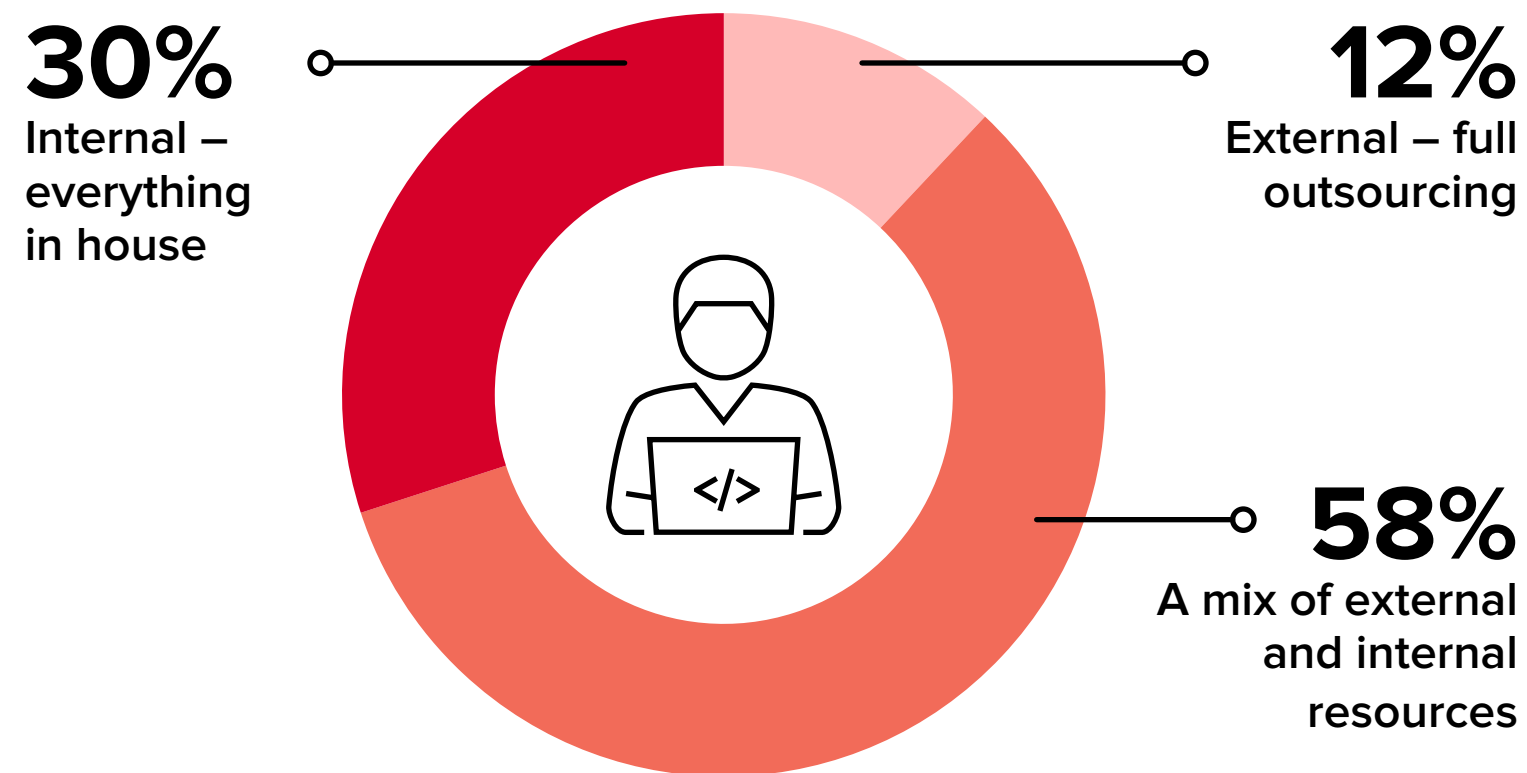


58%

- No insight
- Limited insight
- Partial insight
- Complete insight

Most G&G Data Users See the Need for Either a Better Software Solution or Outsourcing of Data management to Deal with the Ever-Growing Volume and Complexities of G&G Data

Q. Does your organization manage its G&G data using internal resources, external resources, or a mix of the two?

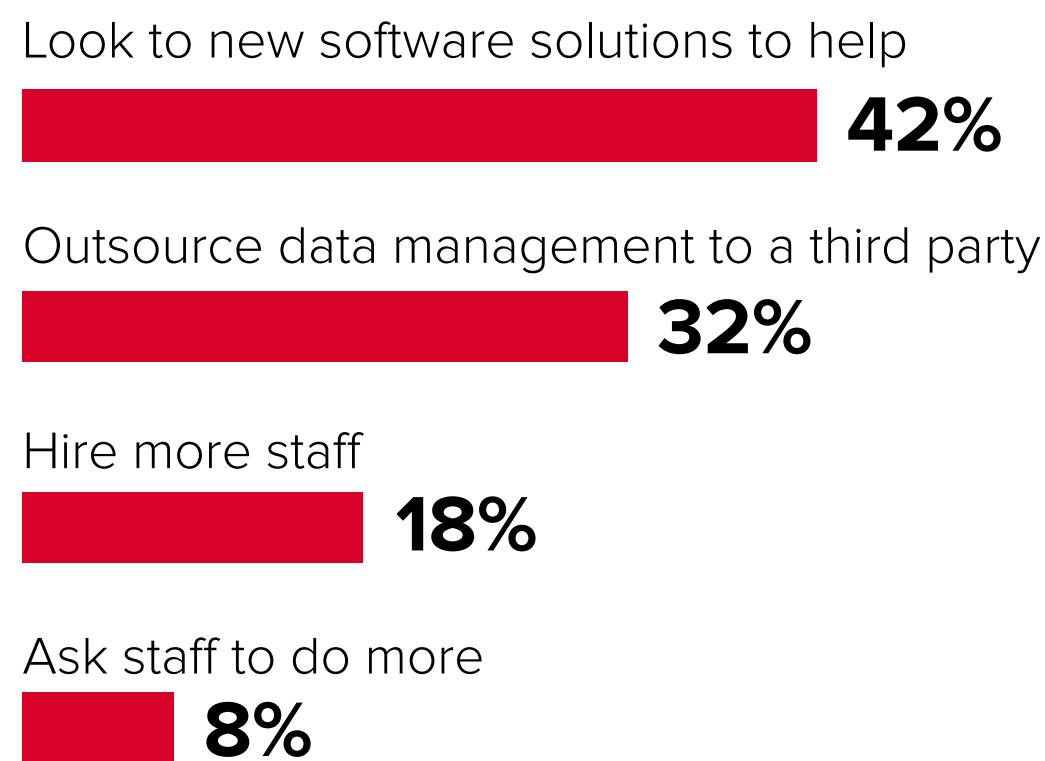


58% of E&P organizations utilize a mix of external and internal resources to manage their G&G data.

External resources in the data management service mix will likely see an increase, as most G&G SMEs recognize the necessity of external solutions (such as software) or full outsourcing of data management to address the increasing complexities and growing volumes of data.

“E&P organizations are embarking upon a journey of data discovery and of finding a digital home for their historic analog geophysical and corresponding data through digitization. As a result, **the velocity, variety, and volume of G&G data have grown, stretching the limits of existing data management applications’ capabilities.** Many organizations have already experienced a deterioration in performance and are contemplating migrating to a more robust alternative, as shown here.

Q. How would you like to see your organization respond to increasing data volumes?



74% of upstream G&G employees say their organizations should either **opt for a new software solution or outsource data management** to a third party.





#3

Transitioning From the Present to the Desired Future State

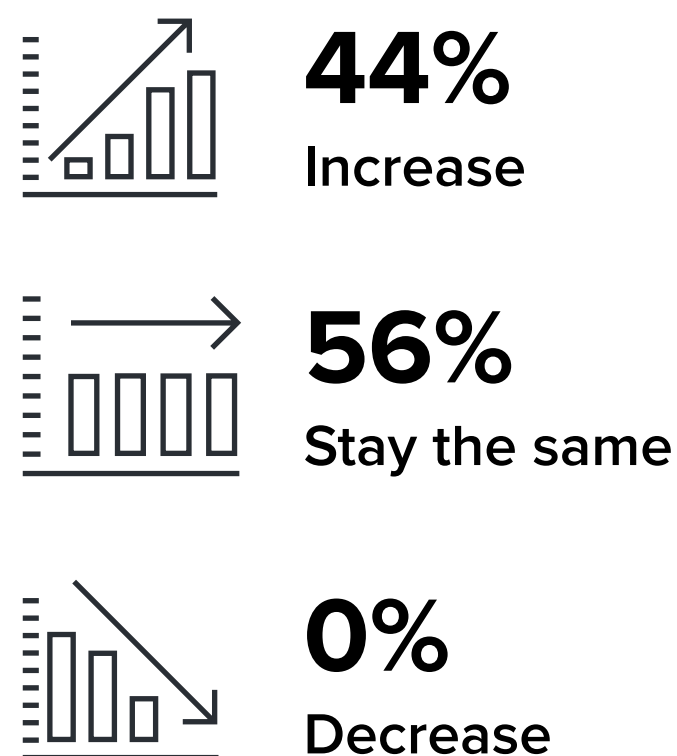
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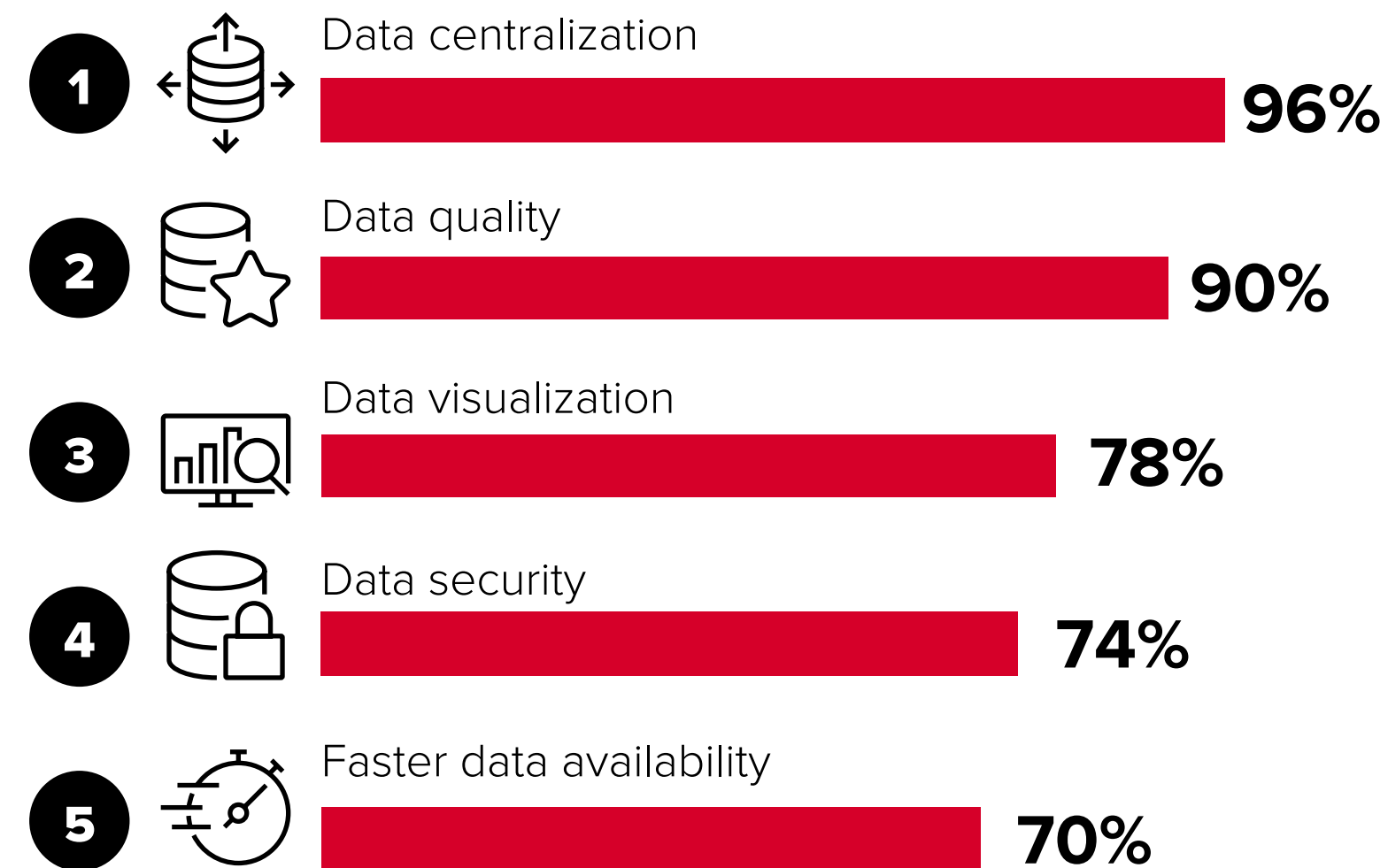
Spend on Upstream Data Management Will Remain Immune to the Current Market Situation; the Spotlight Is on Centralizing Data and Ensuring Data Quality

Q. How do you expect your organization’s spending on upstream data management to change over the next two years?



Investment in upstream data management capabilities will continue despite the current macroeconomic and geopolitical situation, as many organizations have indicated their data management budget will be either the same as in previous years or likely to increase. **No single organization is expecting to reduce spending on data management.**

Q. Which of the following aspects of data management will become or remain priorities for your organization over the next two years? [Choose all that apply]



Updating legacy systems with the latest data management technologies has taken center stage at board-level meetings of E&P companies. Many organizations (44%) intend to increase their spending on data management. While addressing the volume and veracity of G&G data, E&P firms also want to ensure better compatibility with E&P software and seamless workflows within complex multi-application environments.

“Data management-related modernization efforts may require significant investment and time but will lead to increased productivity and cost savings in the long run. Organizations investing in updating their data management have achieved higher success rates in exploration, as well as increased efficiency and effectiveness in drilling, development, and production processes.

E&P Companies Are Planning to Centralize Their Data; the Majority Have Already Begun, Focusing on Specific Data Types

Q. Does your organization centralize or plan to centralize data before it is used downstream?

No, and we don't plan to

8%

No, but we plan to in the next 1–2 years

4%

Yes, but only for a few data types

66%

Yes

22%

“Centralizing the company-wide G&G data on a digital platform can unleash massive business value. **Yet only 22% of E&P firms have centralized or are planning to centralize their entire G&G data estate.** The **majority (66%)** have already centralized or plan to centralize **a few data types.**”



What do E&P firms aim to achieve with a centralized data platform:

- Support and streamline decision-making
- Eliminate fragmented data stored in individual silos
- Ensure data accessibility across the organizations irrespective of geographies
- Provide high-quality data in a standardized format
- Raise data productivity to the next level by eliminating technical and departmental silos

G&G Data Leaders and Managers Need to Consider Industry-Level Hurdles to Data Management Modernization Programs and Related Technology Purchase Considerations

Q. What are the greatest hurdles to updating your organization's data management strategy? [Choose all that apply]

Making the business case for/Demonstrating the ROI of data management projects
80%

Lack of relevant technologies (network bandwidth, storage, processing capacity)
64%

Finding a comprehensive well-integrated data management solution, possibly from a single vendor
64%

Lack of data governance
48%

Lack of relevant skills
48%

Lack of executive buy-in
46%

Data portability between regions/countries being hampered by regulations
40%

For a large group of G&G professionals, “**making a strong business case**” stood out as the **number 1 concern**, as they believe it is holding their E&P companies back from making the investment needed to update their data management strategies.



64% of G&G respondents would prefer to use a comprehensive well-integrated data management solution from a single vendor. The underlying strategy is to choose better over more and to be an efficient data strategist. However, this approach is still a challenge for many E&P operators.



Overcoming hurdles to create a winning strategy is a trait of champions. G&G leaders need to formulate a plan that addresses each of the identified challenges.

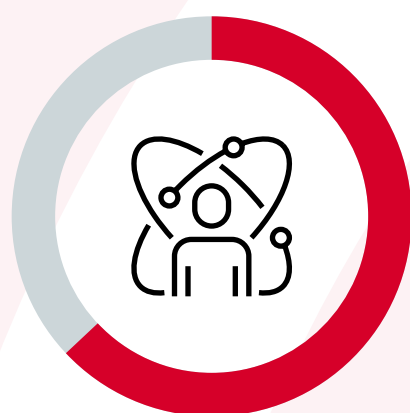
They should consider:

- Benchmarking the tech gap against peers
- Selecting a competent vendor with O&G industry experience and proven expertise in G&G data management
- Helping empower data users and addressing skills gap issues
- Rethinking data governance and security
- Quantifying the total cost of ownership of their existing approach vs. alternative offerings on the market

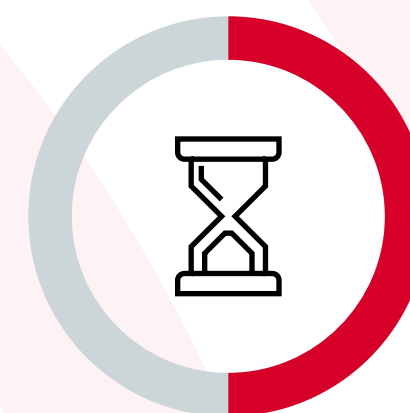
Enabling Robust G&G Data Management Delivers Concrete Outcomes



Q. What are the key metrics that show investment in data management has been improving upstream business performance?



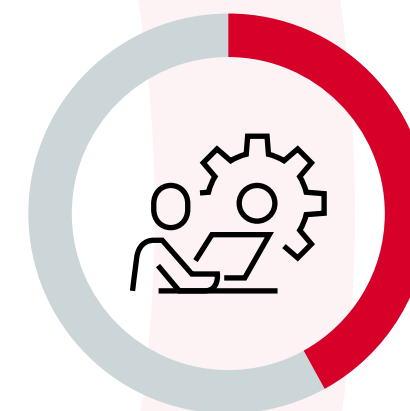
63%
Improved decision-making



50%
Improved time-to-market



60%
Growing pipeline of exploratory prospects



42%
Improved employee productivity



50%
Reduced cost of upstream data operations



35%
Improved rate of production



Guidance for E&P Organizations

1

Align data initiatives with business priorities, and set a mandate for data management to address G&G organization-specific data challenges (e.g., data silos, lineage, integrity, and sharing). Data-centricity and modern data management together can yield significant returns.

2

Review and redefine data governance policies to ensure compliance with regulatory standards. Support data governance with software that can be used for data discovery, profiling, mastering, and lineage tracking.

3

Ensure that the data management software you implement is compatible with any type of G&G data and existing systems and that the investment made positively impacts the organization's bottom line. Never overlook data security.

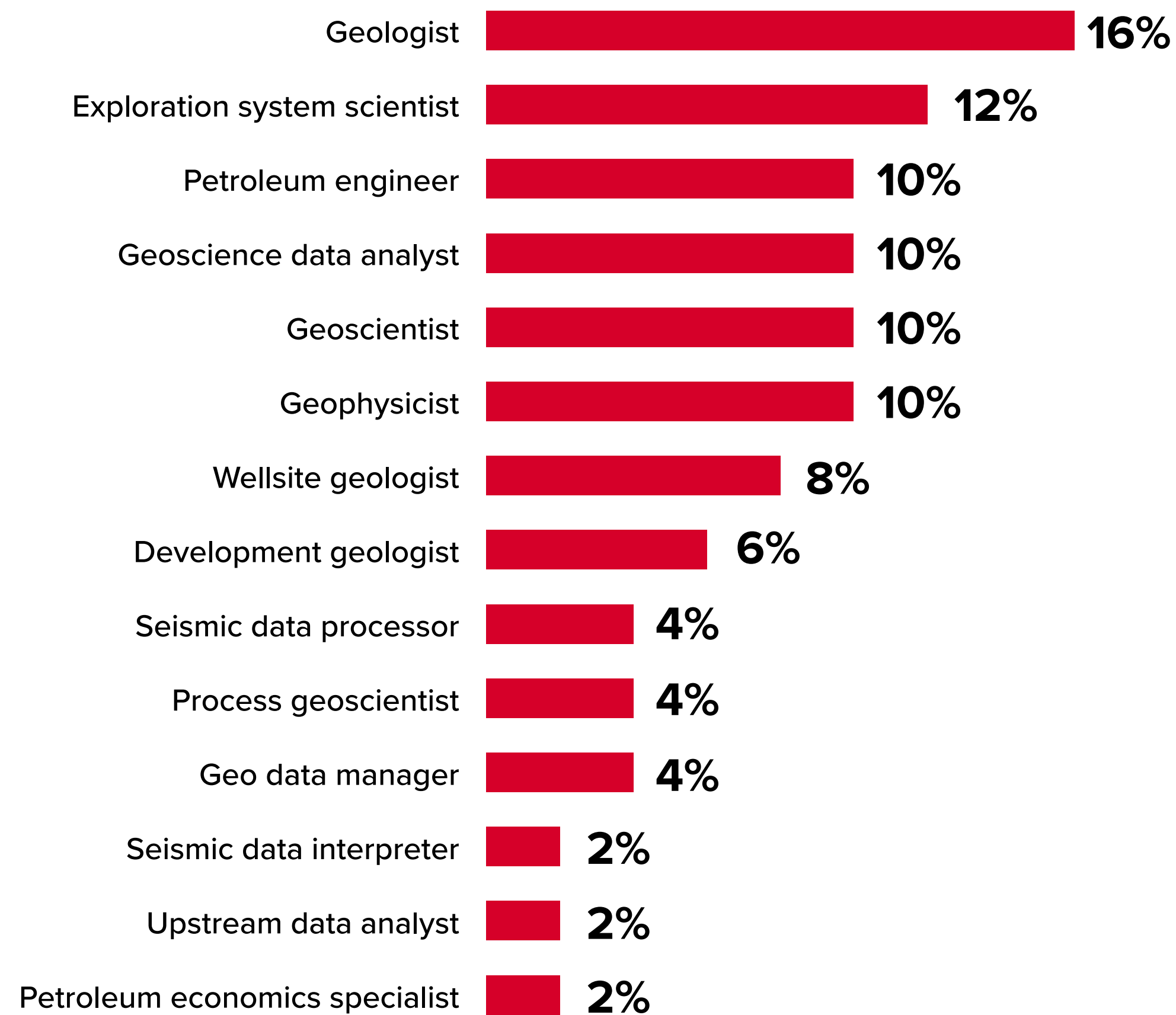
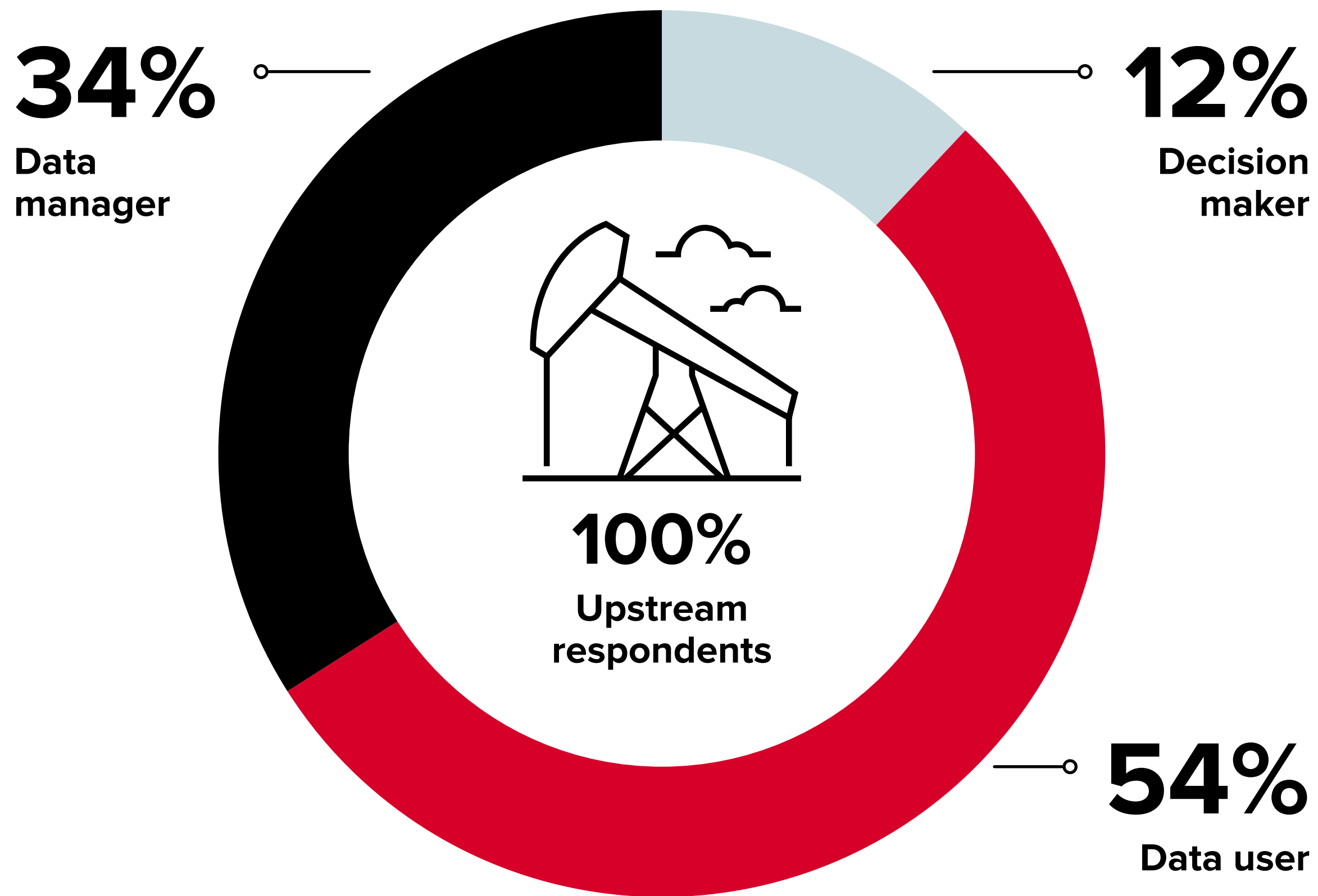
4

Present data management as an adder of value instead of a cost center through G&G user satisfaction and productivity. Reduce total cost of ownership for data management — for instance, by eliminating data duplication and enabling data compression and archiving, thus lowering data storage costs.

5

Consider a data literacy program (e.g., a combination of internal and external upskilling training sessions on data security, data visualization, data quality) to establish a data culture and improve data management skills. Data literacy plays a vital role in achieving the highest possible return on investment in data management and data initiatives.

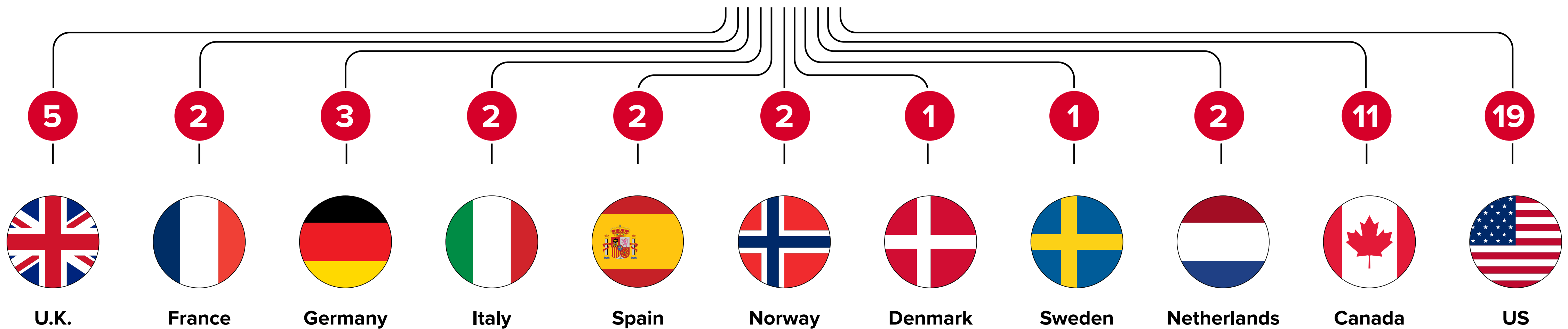
Profile of Survey Respondents



Geographic Breakdown of G&G Professionals Interviewed for this Study

50

G&G Respondents*



Numbers of respondents by country

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We are helping our clients in the upstream industry increase their productivity by addressing many of the challenges outlined in this report.

Operators of all kinds are using EDM for Energy, our cloud-based, workflow automation platform, to set their geoscience teams up for success by eliminating manual workflows for moving and updating data within geo applications and projects.

EDM blends data from multiple applications; synchronizes and governs updates and changes to that data; and distributes mastered data between users, applications, and departments. This allows highly-trained geo specialists to focus on their core jobs and make decisions with conviction, based on consistent, validated data. EDM complements our G&G applications, including Petra and Kingdom.

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