Market Study: 2023 Modern Data Architecture Trends

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Executive Summary

This market study of modern data architecture trends provides insights into how companies consider these leading industry trends in 2023 through their understanding of each concept, its perceived business value and challenges, budgets, and business drivers in data management and analytics.

Respondents ranked "Modernizing to Cloud Data Warehouse" highest at 53% when asked, "what they were currently researching/considering." They also ranked it at 55% when asked if they "understand well and its compelling business value." However, "Real-Time Analytics" was ranked highest when asked which data architecture would be most valuable to their company over the next five years at 50%, followed by "Modernizing to Cloud Data Warehouse" at 44%. This provides insight into how respondents believe compelling business value will shift from cloud data warehouses to real-time analytics.

The Data Lakehouse ranked in a clear second tier with "currently researching, understanding" at 40% and having "compelling value" in the future at 43%. We believe this correlates to the second and third highest-ranked drivers for considering and adopting a new architecture to enable AI and ML analytics use cases and to increase analytics performance, scalability, and agility.

A third-ranked tier included the Data Fabric and Data Mesh, differing by 1% often, followed by Streaming IoT Data slightly lower. Through our survey questions, we can see a potential correlation between the respondents' lower percentage of understanding each architecture and its compelling business value with prioritizing them for adoption over the next five years.

Another way to consider this is based on the years each data architecture trend has been in the data and analytics industry. Cloud data warehouses and real-time analytics have been known for more years than the data lakehouse, followed by data fabric and data mesh concepts for the past two to three years.

This is important because when companies recognize compelling business value whether through vendor marketing, industry education, or informational case studies, they unlock significant budgets approvals. We found that 39% of respondents have approved budgets, and 24% have submitted budgets for initiatives related to modern data architectures in this study. Quantifying these budgets found that 23.8% of respondents have assigned budgets over $1 million. This market study captured 217 qualified respondents that were analyzed to be an accurate representation of companies by size, annual sales revenue, industry, and region. Further, the respondents' roles, departments, functions, and involvement in the process support the accuracy of the data this market study was seeking.

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Figure 1: Has your organization budgeted for initiative(s) related to modernizing the data platform, enabling real-time analytics, adopting Internet of Things (IoT), or enabling AI/ML analytics? (Single-Selection)

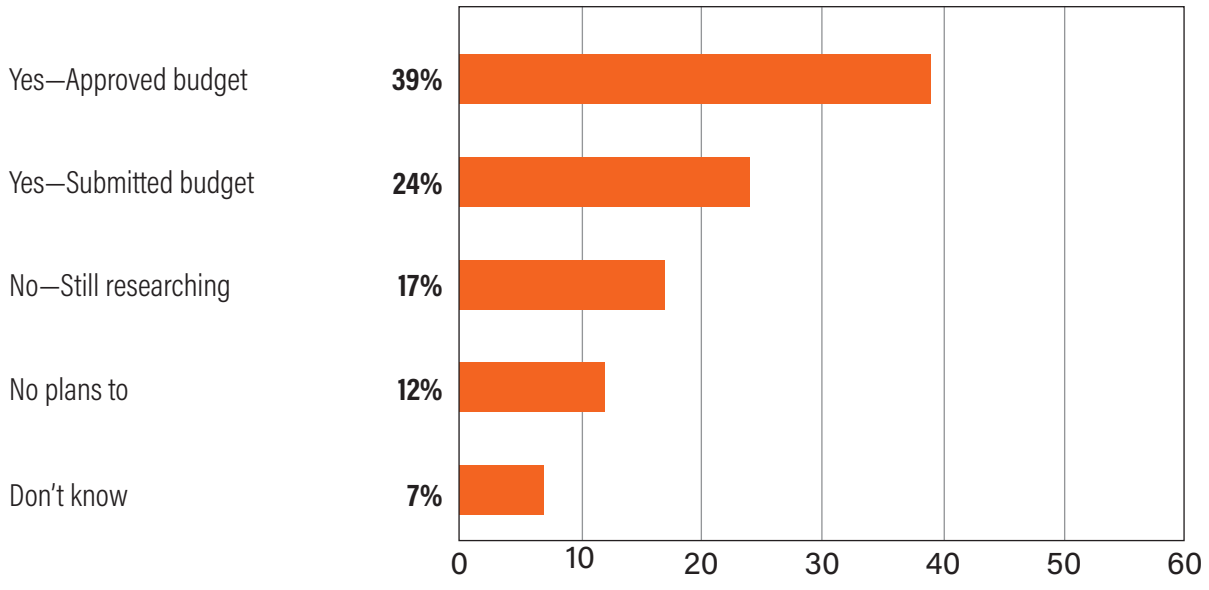
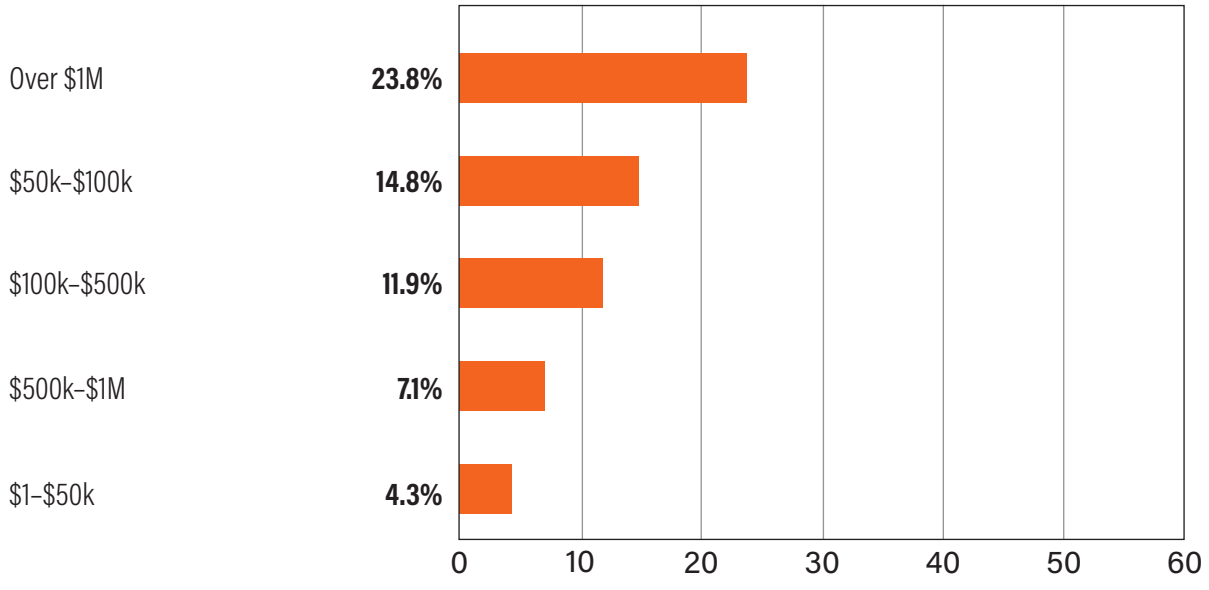


Figure 2: If yes, how much budget is (or will be) assigned for the initiative(s)? (Single-Selection)



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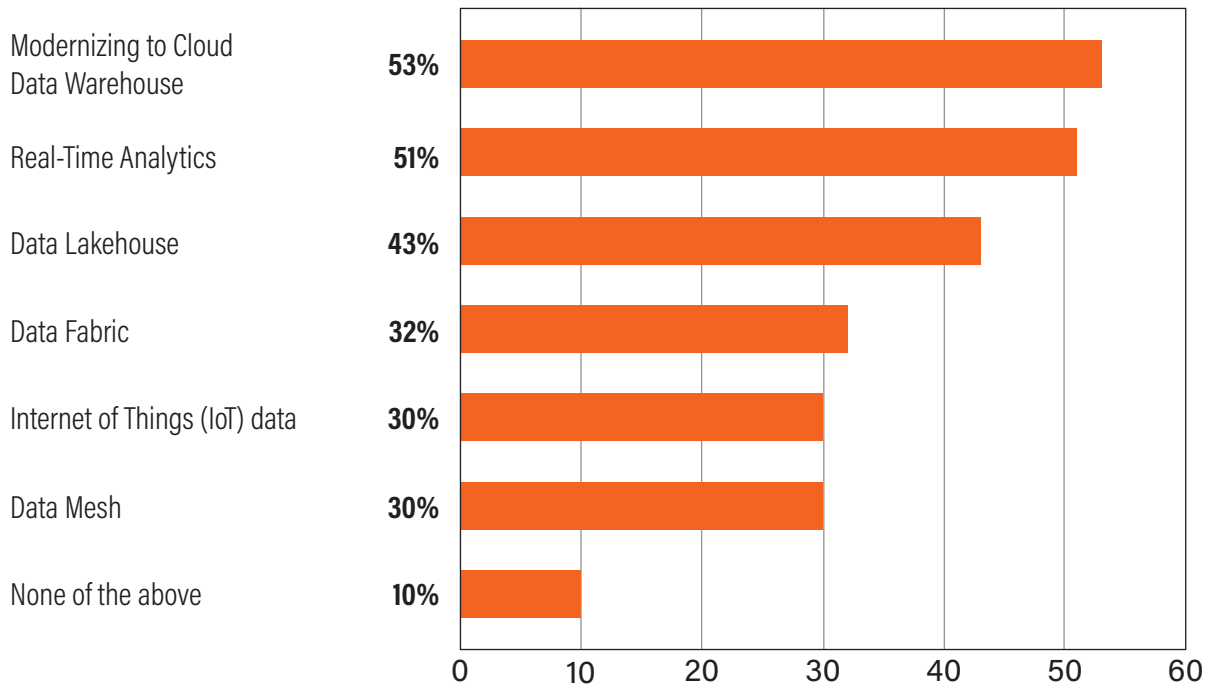
Analyzing Modern Data Architecture Trends

Our first set of questions asked respondents directly to rank among the modern data architecture trends based on what they were researching or considering, understood well and its compelling business value, and what business drivers were involved. We also asked about data sources today and in the future to see if these were a factor in the different data architectures. This provided insights into how each data architecture adoption also could correlate to its maturity and acceptance, where more recent trends require additional research and understanding compared to trends where the business value is well understood and compelling for respondents to see as the most valuable in the next five years. Each data architecture trend could be aligned with its maturity but remember that their demonstrated value over the years is required to sustain its acceptance.

Figure 3. Which of the following data architectures is your company currently researching or considering? (Multi-Select)

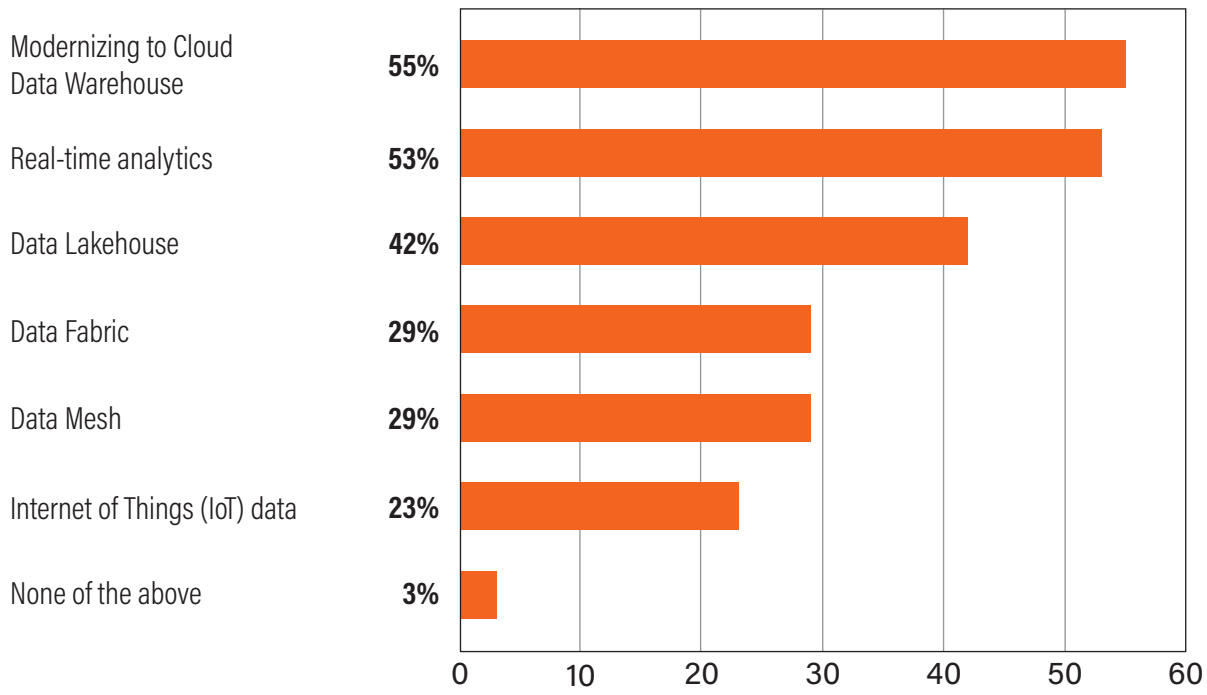


We started by asking a direct question about which data architecture your company is currently researching and considering. It may not be surprising that the first tier of leading trends is "Modernizing to Cloud Data Warehouse" at 53% and "Real-Time Analytics" at 51% due to mainstream adoption over the past five to seven years. We find a clear distinction in a second tier for the "data lakehouse" at 43%, perhaps due to several business drivers being to enable AI and ML analytics use case adoption and increasing analytics performance, scalability, and agility. The third tier of architecture trends includes the "data fabric" at 32%, the "data mesh" along with the "Internet of Things" at 30%. This tier also

represents the newer or emerging trends in data architecture, so it is taking time for this to work its way through awareness, understanding, and acceptance before likely moving up into currently researching. Therefore, we could see how the number of years, successful implementations, or perceived business value translates into the adoption rate.

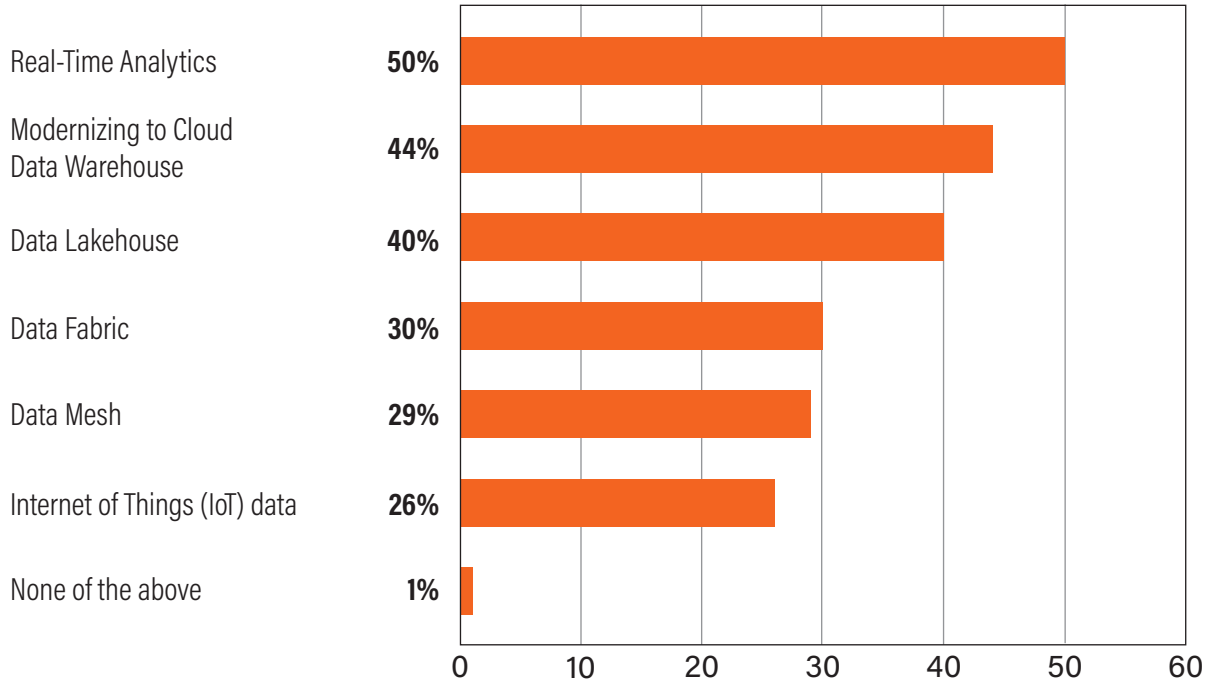
The next question in the survey explores this further, and we find a strong, almost exact, correlation between which architecture trends are being researched and considered and the ones understood to have the most compelling business value. Once again, Modernizing to Cloud Data Warehouse at 55% and Real-Time Analytics at 53% lead in a first tier that shows a correlation between the previous question of currently considering and research with well-understood compelling business value. The second tier with the data lakehouse is 42% and 10% lower. This would seem appropriate, given the industry's maturity level and awareness. Over time, people have had the opportunity to recognize its compelling business value through research and information. The third tier of data architecture trends is distinctly 10% lower again. It correlates with the third tier for currently considering and researching the data fabric, data mesh, and IoT data architecture. Once again, these newer architecture trends most likely will benefit from further awareness and information for companies to understand their compelling business value and drive higher adoption.

Figure 4. Which data architectures do you understand well and its compelling business value? (Multi-Select)



To ask the same question in a forward-looking manner validates these rankings when asked what respondents considered the most valuable to their company in the next five years. While we see the same three tiers in ranking, it is an interesting change that Real-Time Analytics is ranked highest at 50%, followed by Modernizing to Cloud Data Warehouse at 44%. This could represent a shift between today's compelling value in cloud data warehouses and an accepted future value shift derived from real-time analytics.

Figure 5. Which data architecture do you feel will be most valuable to your company over the next 5 years? (Multi-Select)



From later survey question about respondents' data sources today and future data sources, we can see that the velocity of well-established operational systems would contribute to Real-Time Analytics rather than streaming IoT data, which is ranked at 26%. With the number of deployed IoT devices expected to double and triple in the next five years into the billions, we expected IoT-capable businesses to recognize this for operational efficiency and new data and analytics product offerings.

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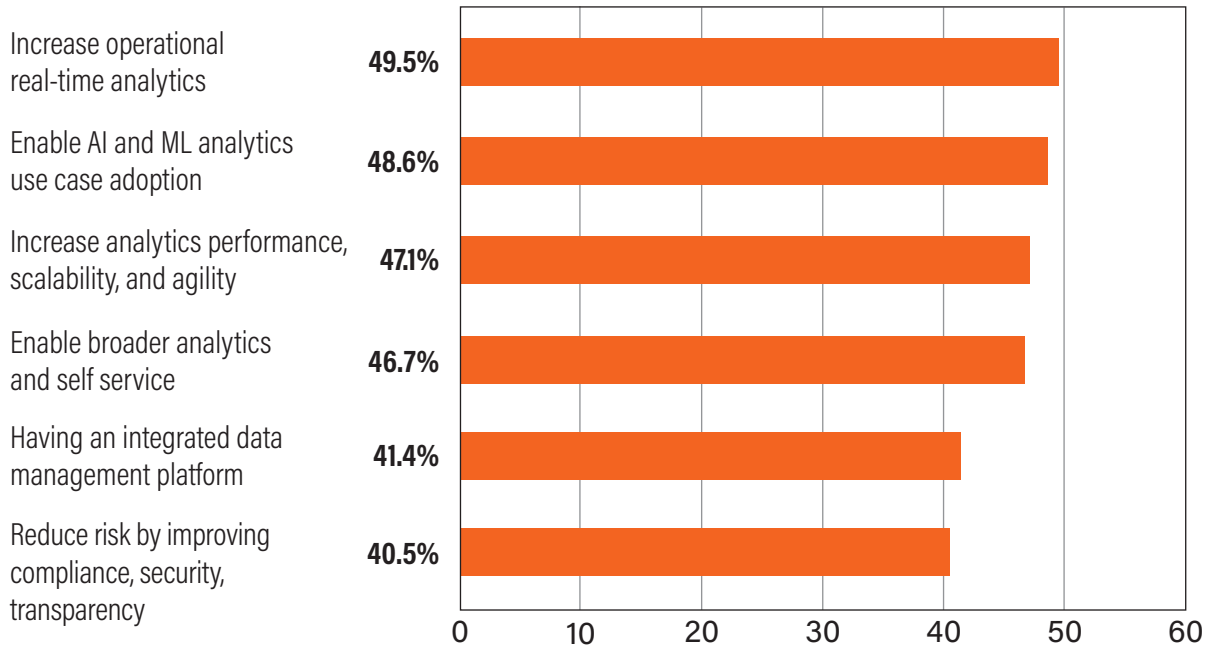
When asking about business drivers for considering and adopting a new data architecture was another way to explore relationships with each data architecture indirectly and independently. While the ranking is clear, the 1% difference across the business drivers is minor except for the highest and lowest ranked. The highest-ranked driver is to increase real-time operational analytics at 49.5%, which correlates with Real-Time Analytics architecture in the highest tier of considering and compelling business value. The business desire to enable AI and machine learning analytics use case adoption is second at 48.6%, which should relate mostly to the Modernizing to Cloud Data Warehouse and/or data lakehouse architecture. The following three drivers are more generalized for enterprises today wanting to increase analytics performance, scalability, and agility or enable broader analytics and self-service. While having an integrated data management platform was fifth in the ranking, it still represented a substantial 41.4% of respondents, which also reduces risk by improving compliance, security, and transparency.

Figure 6. What are your company's drivers for considering and adopting a new data architecture? (Multi-Select)



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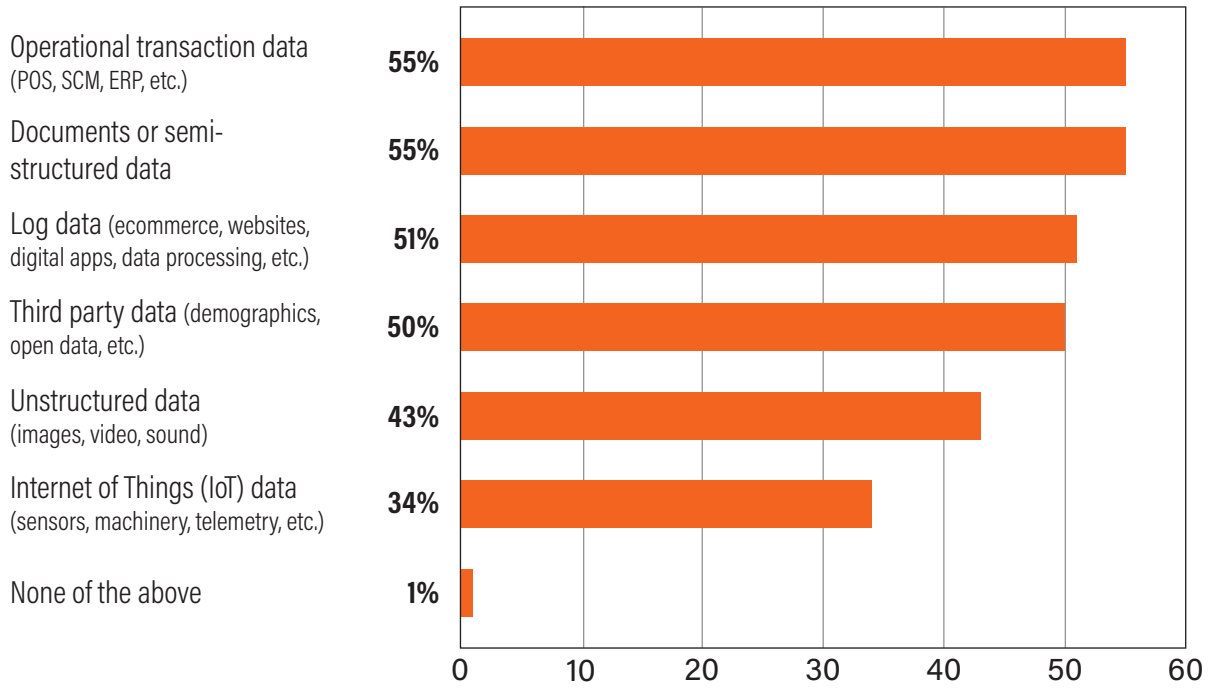
The survey question asking about sources of data is intended to validate if any data architecture trends align with data types. Operational transaction data, documents, and semi-structured data were ranked highest at 55%. This could align with the capabilities of today's more structured cloud data warehouse. Log data from e-commerce, websites, and digital apps was second at 51% and could also align with the real-time analytics nature of those event-based data sources. While unstructured data of images, video, and sound or the Internet of Things data with sensors and machinery should also correlate to enabling AI and machine learning use cases. More specifically, streaming IoT data at 34% could be represented by those respondents in industries such as manufacturing, supply chain logistics, and healthcare. However, it is most likely that a transition from batch to streaming data of operational transactions is driving both Modernizing to Cloud Data Warehouses and Real-Time Analytics adoption.

Figure 7. What types of source data do you have today or expect to have in the next 5 years? (Multi-Select)



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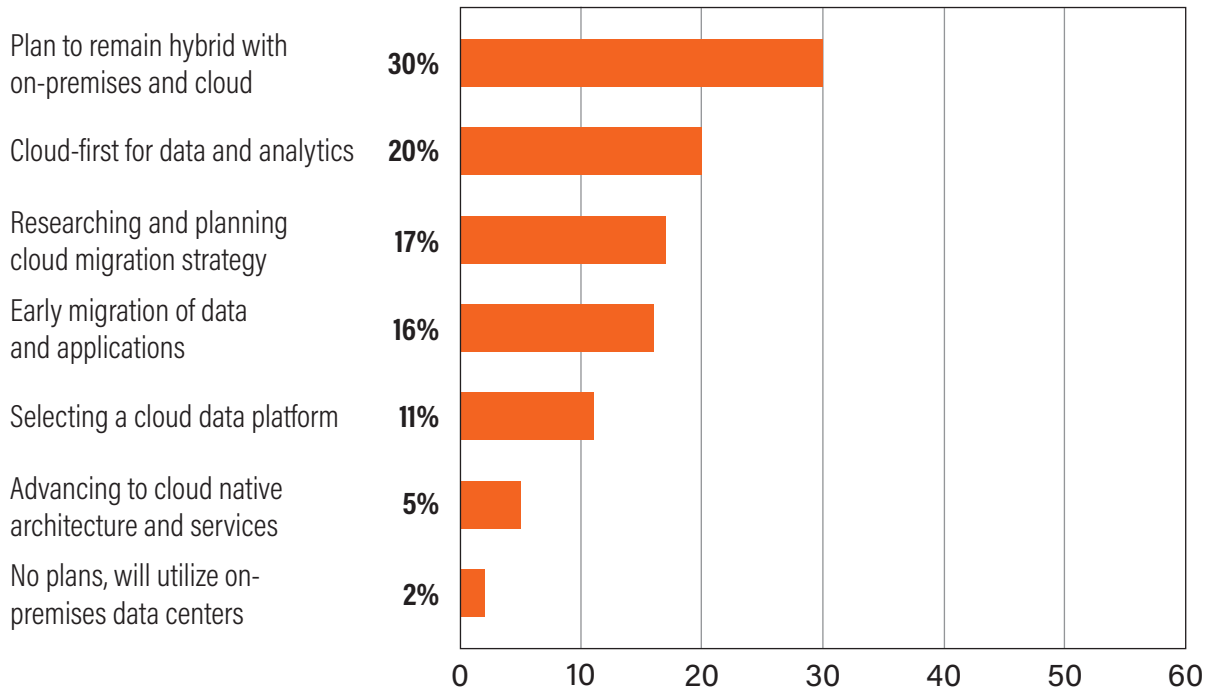
Current State of Cloud Migrations

As we examine how companies are modernizing to public cloud services, it is unsurprising that we find 30% of respondents planning to remain hybrid with on-premises and cloud operations. The cloud modernization initiative has been around for years, with adoption shifting from early adopters to mainstream companies. Most companies who have begun this journey quickly realize that hybrid will be the accurate description for their strategic plans. With 20% of respondents selecting cloud-first for data and analytics is consistent with most hybrid plans but emphasizes the Modernizing to Cloud Data Warehouse initiative being the utmost consideration and value for respondents.

Figure 8. What is the current state of your company's migration to a public cloud service provider? (Single-Selection)



The following three answers for researching and planning a cloud migration strategy are at 17%, early migration of data and applications at 16%, and selecting a cloud platform at 11% could represent the left-hand side or leading edge of an adoption or maturity curve for companies moving towards their cloud initiative. If so, the right-hand side of the curve would represent the advanced side of maturity as companies that have migrated to the cloud are now taking advantage of advanced cloud-native architecture and services.

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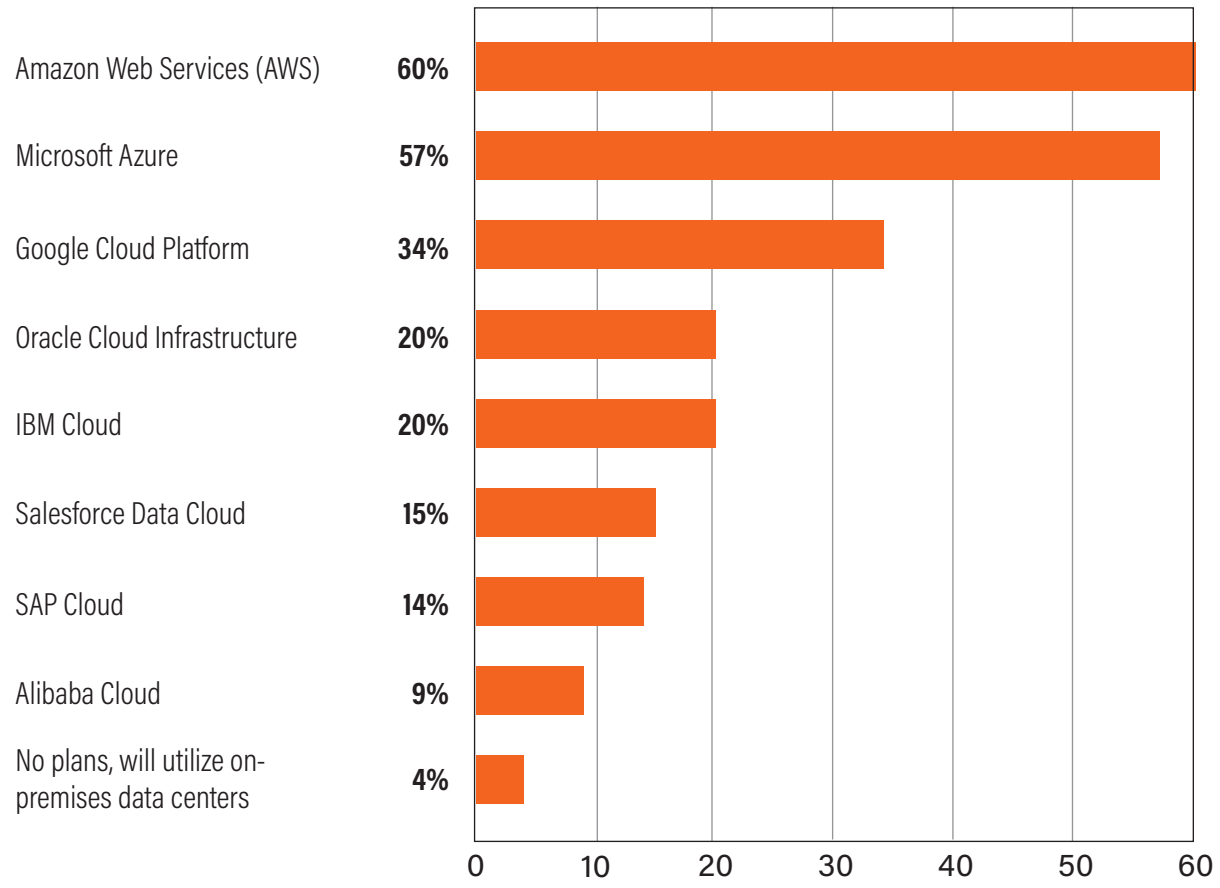
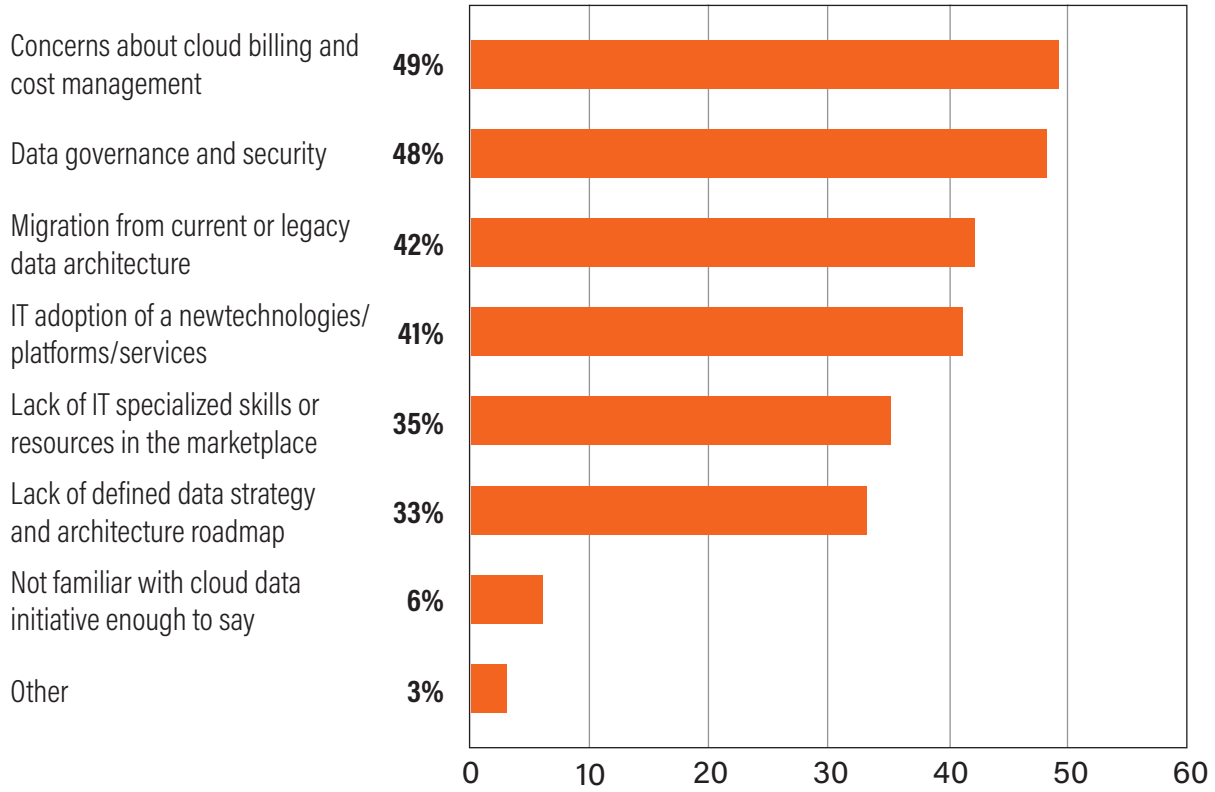
Figure 9. Which public cloud platform(s) do you expect to operate within? (Multi-Select)



When asked the more standard question about their expected cloud operation platform, the ranking agrees with a general perception of cloud operations and further validates this market survey and demographics. As a multi-select question, we are not distinguishing companies with multi-cloud or hybrid-cloud implementations, and we were interested in which public cloud had the most operations. The results are straightforward and consistent with general industry surveys showing respondents expect operations in AWS at 60%, often followed closely by Microsoft Azure at 57%. The Google Cloud Platform is ranked third most often at 34%, and we would expect that to continue to grow over time. Oracle Cloud Infrastructure and the IBM Cloud are ranked equally at 20%, followed by Salesforce Data Cloud at 15%, SAP Cloud at 14%, and Alibaba Cloud at 9%. This ranking could be influenced by our regional demographics having 51% of respondents in North America, followed by EMEA and APAC.

Figure 10. What do you believe are obstacles for your cloud data migration to overcome? (Multi-Select)

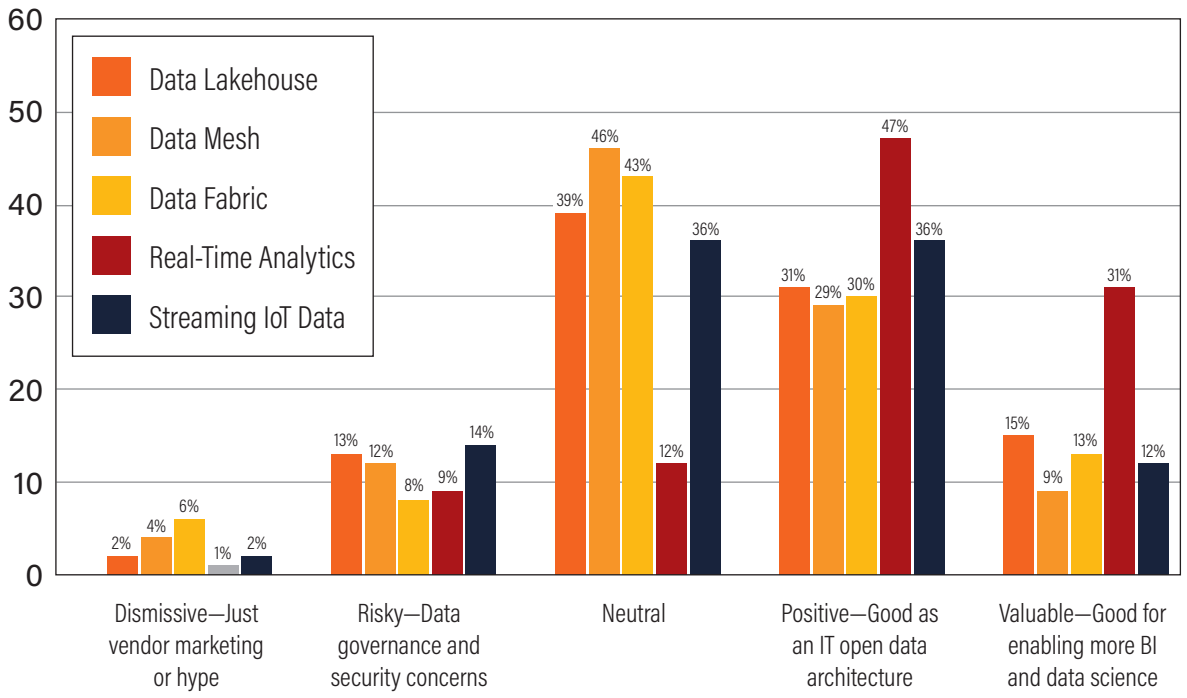


We explored which perceived obstacles to cloud data migration might significantly hinder adoption for companies. Concerns about cloud billing ranked highest at 49%, followed closely by data governance and security concerns at 48%. This is consistent with our expectations based on field research and client work at Radiant Advisors. People often hear about or experience firsthand the difference in usage-based cloud billing from their on-premises data centers. In the past year, other leading trends are responding to this with movements in data observability and FinOps as companies seek more transparency and control over cloud billing through cloud controlled optimizations. Data governance and security is traditionally a serious concern and remains ranked second. The following two obstacles are related to the migration away from a legacy data architecture at 42% and its corresponding adoption of new technologies, platforms, and services at 41%. As cloud data migration has matured over the years, lessons learned have taught companies about the challenges with this migration and not to underestimate it. The third grouping of obstacles deals with the execution of a cloud migration initiative. It includes a lack of IT specialized skills or resources in the marketplace at 35% and a lack of a defined data strategy and architecture roadmap at 33%.

Comparing Modern Data Architecture Trends

One of the things that we wanted to do in our survey was compare the five leading data architecture trends among a standard set of parameters. Here we discovered a likely correlation between the understanding of the concept and business value to the data architecture's adoption.

Figure 11. What is your general impression of the "…" concept in the industry? (Single-Selection)



When analyzing the respondents' general impressions of a data architecture conceptually, we observed the consistently low single-digit percentages for being considered dismissive or just marketing hype - this validates all five data architecture trends. A slight increase in percentages from 8% to 14% is considered risky for data governance and security concerns. This risky impression could hinder the adoption of streaming IoT data at 14% and the data lakehouse at 13%. There is a significant portion in the neutral impression averaging around 40%. However, Real-Time Analytics has by far the lowest percentage of neutral impressions at 12%, corresponding with its significant shift to both positive and valuable impressions. Real-Time Analytics is the only data architecture trend, with this offset totaling 78% in overall positive impressions. Looking at overall positive and valuable impressions, Streaming IoT data is second with 48%, followed closely by data lakehouse at 46%, data fabric at 43%, and data mesh at 38%.

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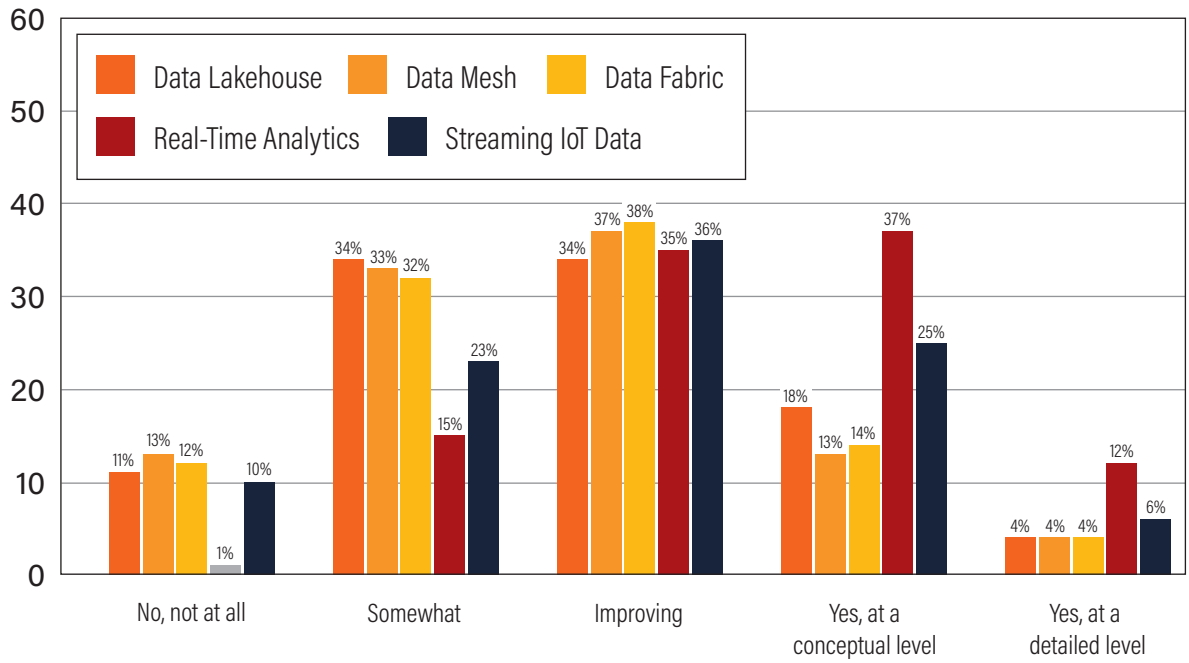
Figure 12. Do you think the "…" definition is well understood and consistent in the industry? (Single-Selection)



Continuing to analyze each data architecture trend is the relationship between its general impression and how well each definition is understood and consistent within the industry. These results are consistent with what we see in the industry overall based on inquiries from clients and conferences and serve as an indicator of where the data and analytics industry need to focus on for better well-understood definitions. This understanding translates to recognizing the business value, leading companies to consider and research for adoption.

As expected, the data architecture trends average an approximately low 10% in the "no, not at all" understanding level, except for Real-Time Analytics at 1%. There is an even split between "somewhat" and "improving" for the data lakehouse, data mesh, and data fabric, around 35% in each category. This is as expected, with these data architectures being relatively new, definitions being solidified, and industry consistency improving.

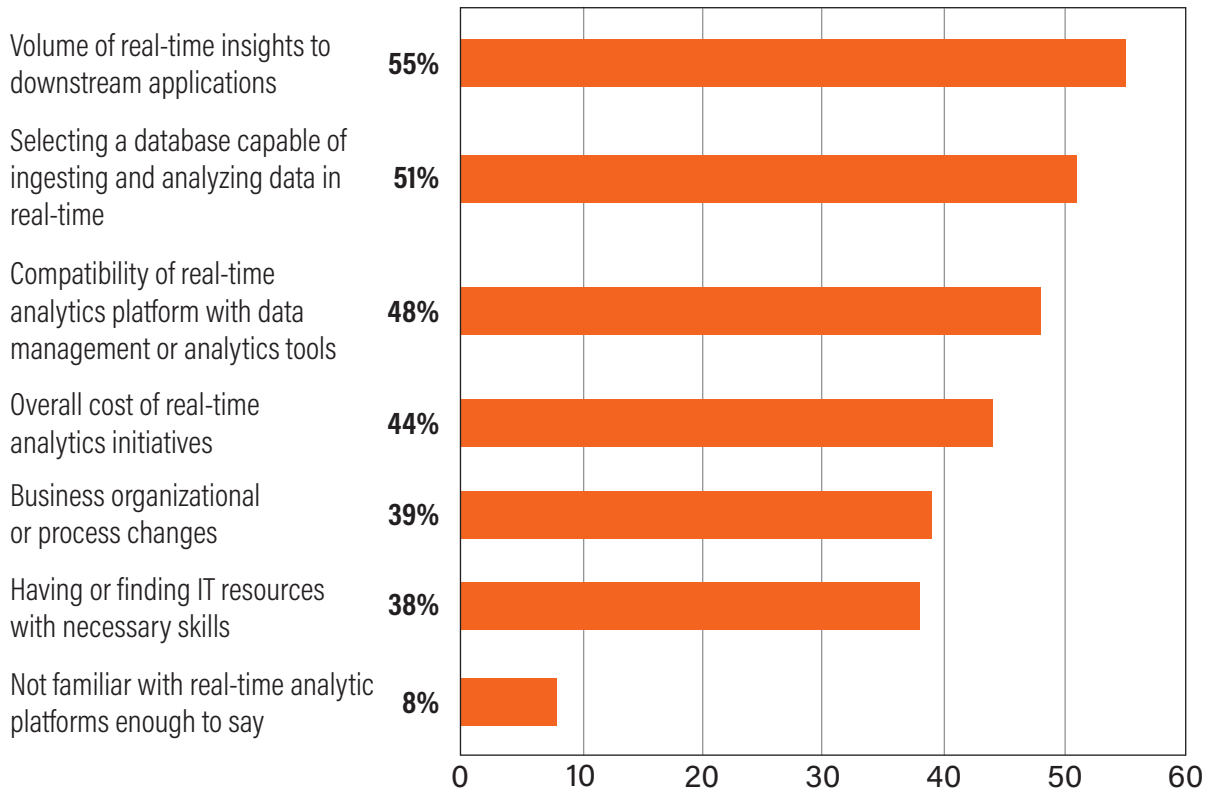
The standout exception is that Real-Time Analytics and streaming IoT data are better understood at the "conceptual level" and Real-Time Analytics at the "detailed level." This understanding correlates with the rest of the survey showing that Real-Time Analytics has one of the highest compelling business value ratings today and for the next five years.

A respondent's general impressions about a data architecture trend conceptually likely correlate to how they believe there is strategic business value for overcoming obstacles. Therefore, we are finding that the better a respondent understands the definition influences how they can imagine its potential business value as a positive and valuable impression for the business.

Real-Time Analytics

Real-Time Analytics was the modern data architecture trend that was the highest rated by our respondents and was the leader in the most valuable over the next five years. This corresponded with the number one driver for the new architecture: increased real-time operational analytics at 49.5%. Regarding this most valuable ranking, recall the two other survey questions regarding what is currently being researched and considered and the compelling business value questions understood. Real-time analytics was ranked second and only 2% lower than the leader, Modernizing to Cloud Data Warehouse. Digging deeper, we explored how respondents perceive achieving the business value and overcoming its challenges.

Figure 13. What do you believe are the challenges for a real-time analytics initiative to overcome? (Multi-Select)



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When it comes to challenges that need to be overcome when moving to a real-time analytics architecture, the highest ranked concern is dealing with the volume of real-time insights to downstream applications at 55%, which is not about the data architecture itself but rather its consumers of data and analytics applications.

Surprisingly, the second-ranked concern at 51% is selecting a database capable of ingesting and analyzing data in real time. While Radiant Advisors has hands-on experience with these databases through benchmarks and analyst relations with database vendors that excel in streaming data analytics and multi-modal analytics for clients, the data and analytics industry needs more consistent recognition and categorization of real-time analytics databases by its thought-leaders, industry analysts, industry media, and vendors themselves to diminish the confusion. Perhaps the current focus is on cloud data warehouses that are typically more batch-oriented and scalable than real-time analytics oriented. Fortunately, there are proven databases for real-time analytics available in the market. The third-ranked concern is the compatibility of real-time analytics platforms with data management or analytic tools. Once again, we believe this is likely related to a lack of awareness of the database platforms themselves and their partner ecosystem of tools and products.

The second tier of challenges includes the overall cost at 44%, business organizational change to process at 39%, and having or finding IT resources with the necessary skills at 33%. Interestingly, while Real-Time Analytics is highly ranked as well-understood, it historically had the perception of a high operational cost. The ongoing advancements in technologies and cloud platforms have demonstrated that this is no longer the case. Companies can quickly provision cloud real-time analytics and database at a relatively low cost. Another result of this high-cost perception is that companies ask for real-time requirements to justify a perceived high cost, further hindering adoption. Today, companies can quickly turn on cloud services for real-time analytics and have data flow into applications in hours or days.

Furthermore, the perceived obstacle for specialized IT resources and skills at 38% should be addressed by vendors as they are only slightly different from base IT skills. Several of these perceived obstacles should be resolved through increased awareness and education.

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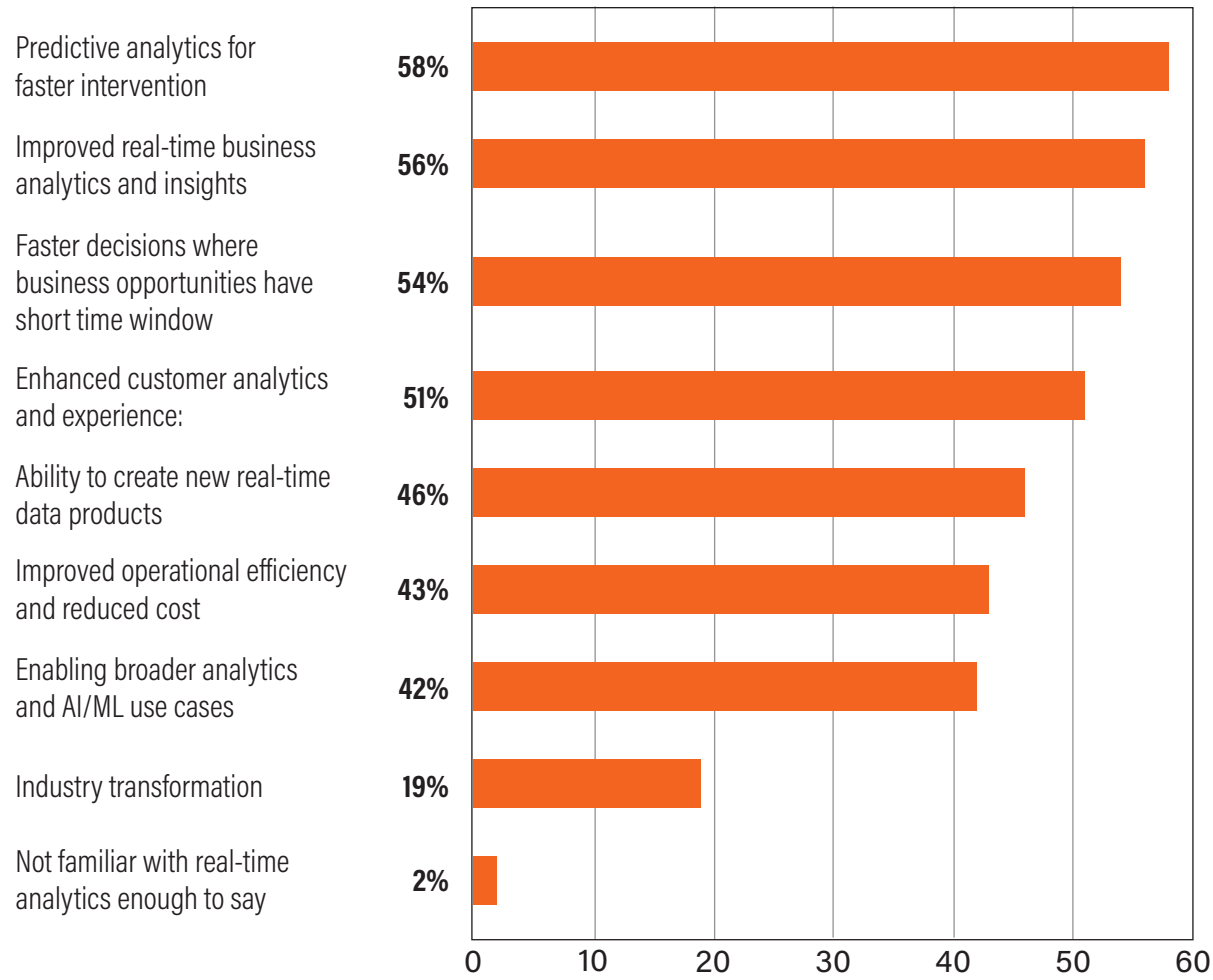
Figure 14: What do you believe are business value outcomes for a real-time analytics initiative? (Multi-Select)



We see three different groupings in the percentage rankings regarding the business value outcomes related to having a Real-Time Analytics data architecture. The first group contains the top four answers ranging from 51% to 58%. Here, we have predictive analytics for faster intervention at 58% for the ability to respond to events in real-time to analyze and take action. This is closely followed by improved real-time business analytics and insights at 56% and faster decisions, where business opportunities have a short time window at 54%. Here we find faster response times being the primary value driver when reacting "in the moment" with analytics and predictive analytics.

A second grouping starts at 51% with enhanced customer analytics and experience. In this category, answers group into a more generalized analytics value for customer analytics and the ability to create new real-time data products. These improvements are innovation-driven and have a natural challenge to imagine new products that need to be deployed on a real-time architecture that may not exist.

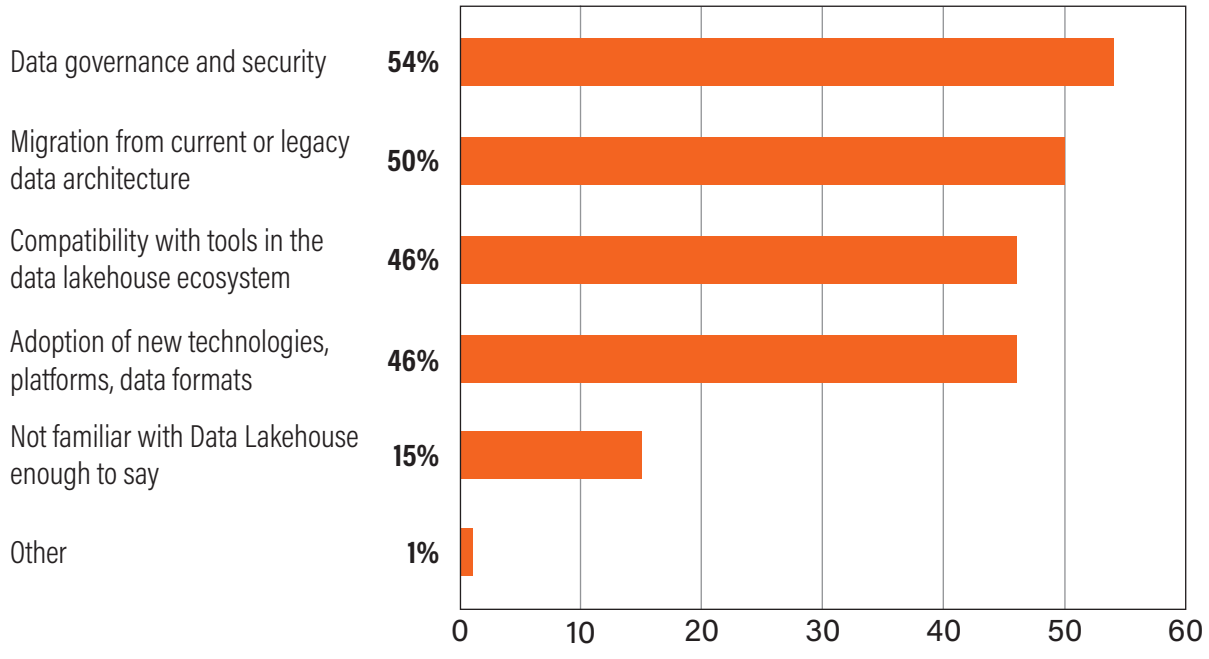
Once again, this innovation barrier has been eliminated in the cloud to experiment and test new real-time analytics products. Also, this second group is a general answer for improved operational efficiency for a reduced cost of 43%. This business value outcome is surprisingly lower in the overall ranking as we see answers related to innovation and faster opportunities.

The third grouping deals with enabling broader analytics that drive AI and ML use cases at 42%. While training AI and ML models are mostly batch-oriented, it is implementing them in real-time with event streams of voluminous data that is closely related to the top-ranked predictive analytics for faster intervention at 58%. A relationship exists between enabling broader analytics with AI and ML use cases. Surprisingly, there is a sharp % drop off for industry transformation at 19%. Perhaps this is more related to the respondent demographics for industry representation.

Data Lakehouse

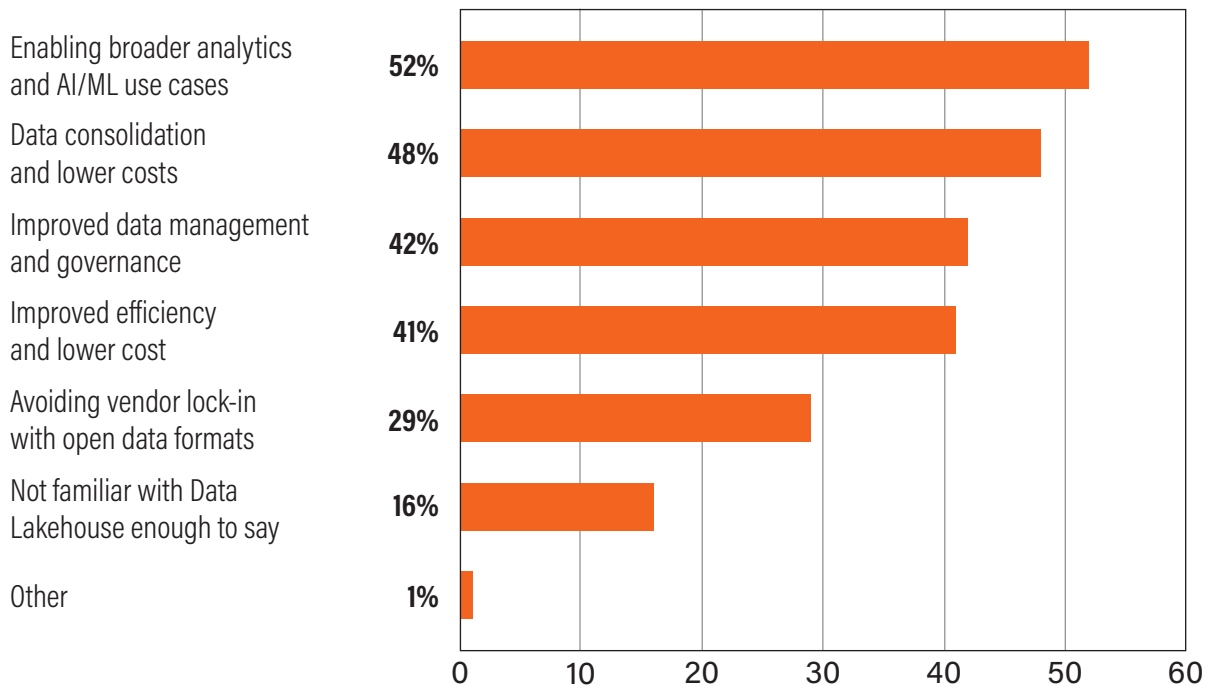
The data lakehouse is ranked third in the survey as most valuable over the next five years. This correlates to the drivers for new architecture and enabling AI and ML analytic use case adoption. It is no surprise in this correlation as the data lakehouse is known for bridging the analytics capability between business intelligence and data science. The data lakehouse is also recognized for its ability to increase analytics performance, scalability, and agility. We can also contribute to its ranking in this year's survey as a maturity level following longer established Modernizing to Cloud Data Warehouse and Real-Time Analytics and somewhat older than data fabric and data mesh concepts.

Figure 15: What do you believe are challenges for a Data Lakehouse initiative to overcome? (Multi-Select)



When we look at the challenges that need to be overcome for respondents and their companies to adopt the data lakehouse, the highest-ranked challenge is related to data governance and security at 54%. As a new data architecture, the data lakehouse may not have established itself as a viable security and governance control as long-standing relational database management systems. The second highest-ranked challenge is migrating from the current or legacy architecture at 50%. Large-scale migrations are always a concern for companies with well-established data science platforms, Hadoop platforms, or large data warehouses that can be in production for 5 to 10 or even more than 20 years. The challenge of compatibility with tools in the new data lakehouse ecosystem was ranked at 46%. Data accessibility is likely the main concern for a semantic layer or all the different BI and data science tools. Fortunately, this ecosystem continues to proliferate as companies select from a few data lakehouse options in the open data architecture formats such as Parquet or Iceberg file formats. Many companies with existing big data platforms may have massive amounts of data files to convert, and compatibility is critical.

Figure 16: What do you believe are business value outcomes for a Data Lakehouse initiative? (Multi-Select)

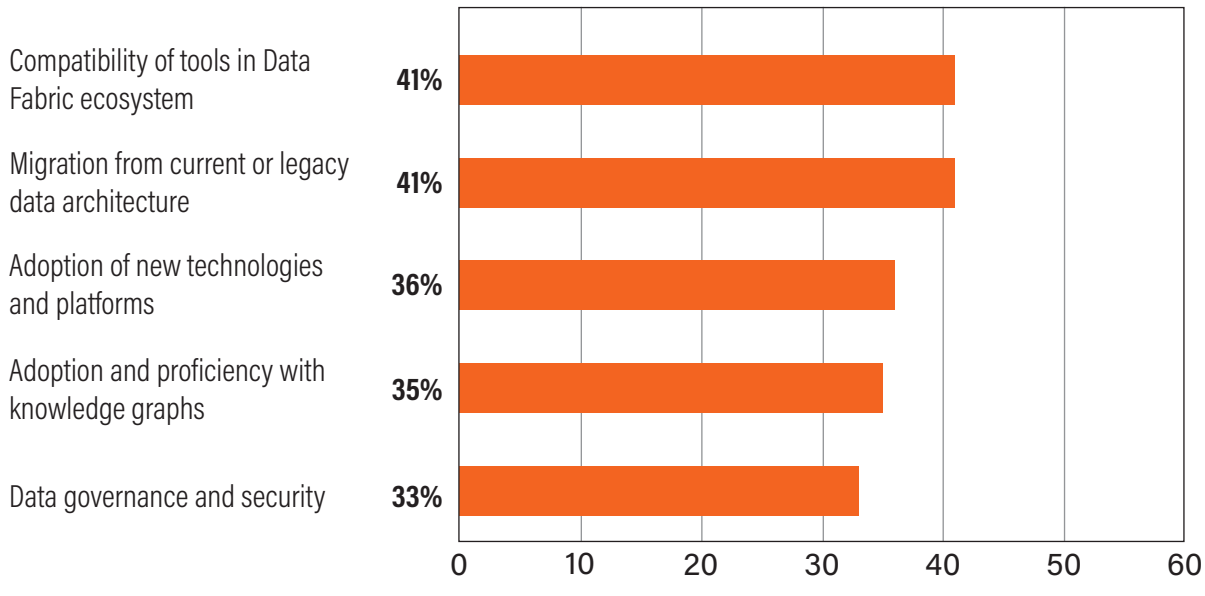


While analyzing how the respondents rated the business value outcomes for the data lakehouse, it was unsurprising to see that the highest-ranked business value outcome enables broader analytics and AI and ML use cases at 52%. As the data lakehouse closes the gap between its data science community originators and more accessible business intelligence, broader AI and ML use cases are a clear benefit. Also not surprising was data consolidation and lower costs at 48% being recognized as a benefit with an open data architecture that allows multiple uses of the same data, which is the basic premise of the data lakehouse. At 42%, improved data management and governance likely related to data consolidation and elimination of data silos and was the highest-ranked challenge to overcome for data governance and security. Improved efficiency and lower cost were ranked next at 41%. Avoiding vendor lock-in with open formats was surprisingly ranked low at 29% because this is a common argument repeated in the industry for the data lakehouse architecture. Therefore, while avoiding vendor lock-in will continue to be evangelized and debated in the industry, this survey shows that it is not the highest-ranked business value outcome.

Data Fabric

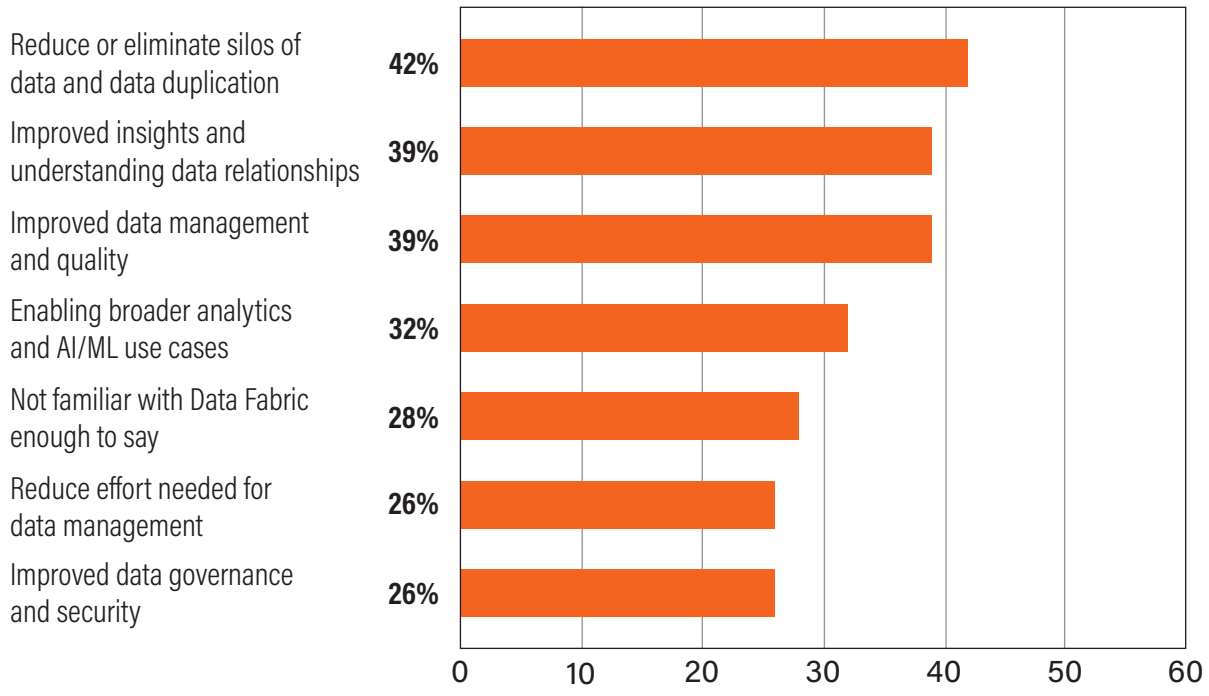
Data fabric and the data mesh architectural trends ranked nearly equal based on the data collected in this survey. They were only separated by one or two percentage points in each category for a specific factor. Both are reasonably understood in their definition and consistency averaging around 38%. Furthermore, both have definitions that are improving and understood at the conceptual level at 13% and 14%. The general impression of positivity for data fabric is at 30% compared to the data mesh at 29%. Regarding the impression of value for enabling BI and data science, the data fabric is 13% compared to the data mesh at 9%. There is a possible relationship that data fabric is related to having an integrated data management platform ranked at 41.4% when referring back to drivers for new architecture.

Figure 17. What do you think are challenges for a Data Fabric initiative to overcome? (Multi-Select)



Analyzing the challenges that the data fabric will need to overcome, our respondents believe that both the compatibility of tools in the data fabric ecosystem and the migration from their current or legacy data architecture is the biggest challenge to overcome at 41%. This is similar to other data architectural trends for compatibility and migration. A second grouping at 35% and 36% is similar to other data architectures for adopting new technologies and platforms and adopting the proficiency of working with knowledge graphs, which is at the heart of many data fabric architectures. Respondents did not rank data governance and security as a significant challenge for data fabric at 33%.

Figure 18. What do you believe are business value outcomes for a Data Fabric initiative? (Multi-Select)



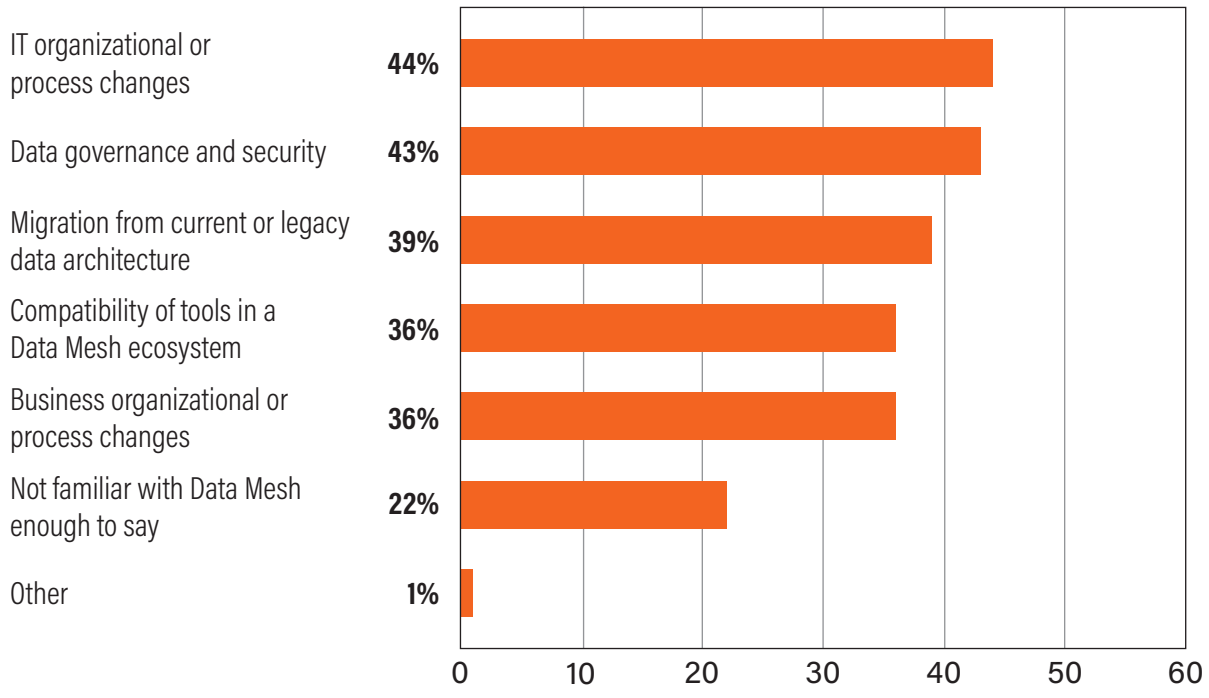
Looking specifically at the business value outcomes for the data fabric, the tailored options we put in the survey captured responses for all of them. The ability to reduce or eliminate data silos and duplication ranked highest at 42% through its ability to interweave data across the enterprise. Improved insights and understanding of data relationships were at 39%, generally accepted as the main driver for moving to the data fabric, along with improved data management and quality at 39%. This understanding of data fabric reflects its core tenets for improving data management and finding new hidden relationship insights. When considering the following business value outcome - enabling broader analytics and AI and ML use cases, this is likely related to the data fabric's ability to find and understand data assets easily are analytical use.

The option for not familiar enough to say was at 28% for the data fabric and should correspond with the emerging nature of this data architecture. As an emerging data architecture with improved understanding still in play, we expect this to diminish over time as the data fabric gains acceptance. At 26%, we find reduced effort for data management and improved data governance and security as the lowest ranked. As the definition of data fabric gains clarity and acceptance, it will be interesting to see if the reduced effort in data management increases over time. As for data governance and security, respondents do not believe there is a direct relation or purpose for the data fabric to do so today.

Data Mesh

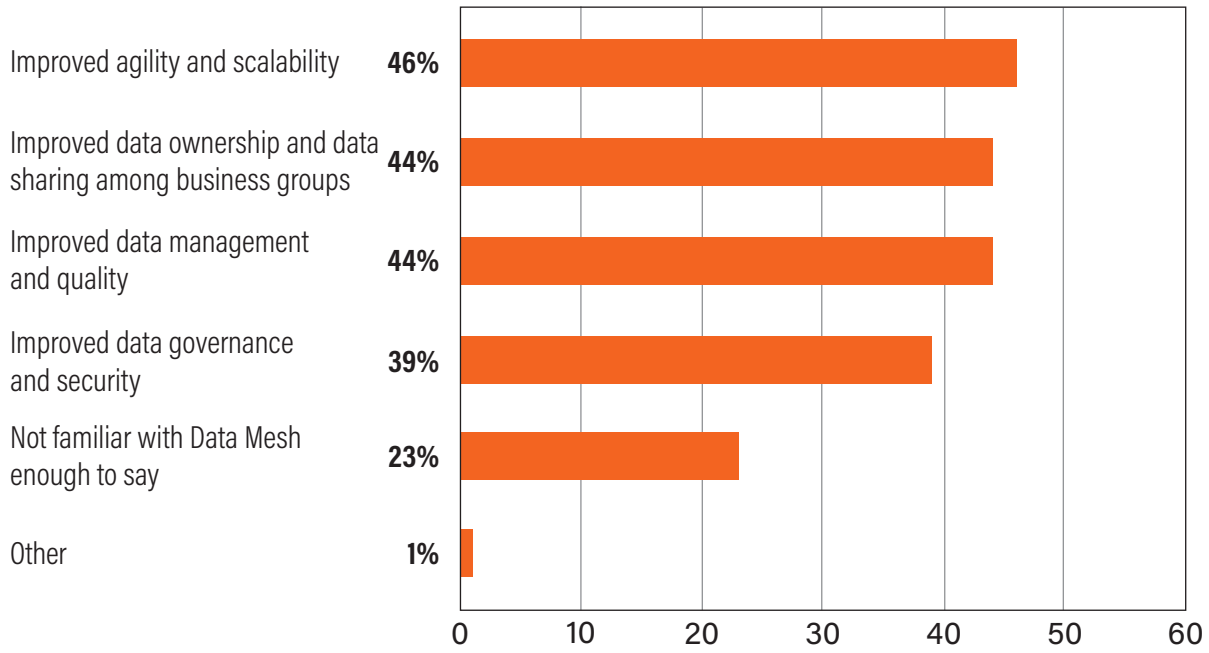
The data mesh as a data architecture trend falls into our third tier of being the most researched or considered for its business value along with the data fabric. This ranking is mainly related to its maturity as an architecture pattern and organizational approach to data management and self-service. For its age in the market, the data mesh has a standout definition understanding and consistency at 33% somewhat and 37% improving. The data mesh is consistently ranked 30% for research, consideration, business value, and value in the next five years. Looking at the drivers for the new architecture, we find that increased analytics performance and agility and enabling broader analytics and self-service likely contribute to what companies are looking to the data mesh for. The general impression around the data mesh concept compared to other data architecture trends shows that its dismissive ranking is very low. It is on par with the other data architectures for risk. The positive impressions for good as an IT open architecture is the lowest for the data architectures at 29%. The impression of valuable and good for enabling more BI and data science is the lowest at 9%. We believe data mesh as a distributed architecture empowers business groups to be more autonomous rather than broadly enabling BI and data science through self-service.

Figure 19. What do you believe are the challenges for a Data Mesh initiative to overcome? (Multi-Select)



The challenges to overcome for the data mesh are closely ranked together and range from 36% to 44%. IT organizational or process changes are ranked as the highest challenge to overcome at 44%. Surprisingly, business organizational or process changes were ranked lowest at 36% despite a general industry consensus that business organization is the hardest for data mesh implementations. An organizational strategy for data ownership and self-service with collaborative governance is at the heart of the data mesh concept. Interestingly, those two are at opposite ends of the challenges to overcome. Data governance and security was ranked as the second highest challenge at 43%. This is consistent with the industry concern we see with more advanced distributed and autonomous approaches to data architecture. Migration from the current or legacy architecture was ranked at 39%, and the compatibility of tools was 36%, consistent with all the other data architecture transformations.

Figure 20. What do you believe are business value outcomes for a Data Mesh initiative? (Multi-Select)



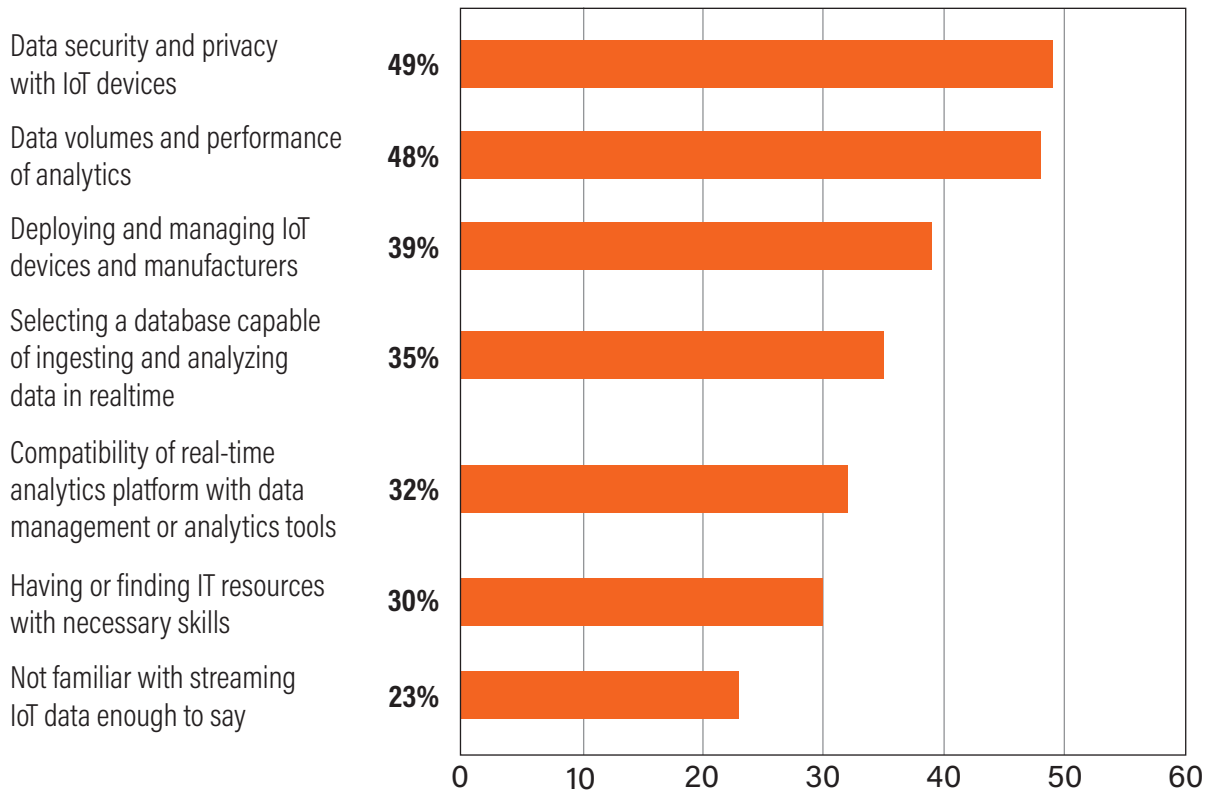
Looking at the expected business value outcomes from data mesh and its drivers for adoption was straightforward and closely clustered between 39% and 46%. Improved agility and scalability are well-accepted benefits of the data mesh with a distributed approach to data management and data culture. Improved data ownership and data sharing among business groups ranked at 44% and is unique to the data mesh approach. Similarly, improved data management and quality was 44% which speaks to the benefits of improved data ownership by business groups. Improved data governance and security was ranked lower at 39% among respondents, perhaps due to the necessity of an effective data governance strategy for the distributed data mesh approach to work. Once again, at the bottom are respondents saying not familiar enough to say at 23%, which likely results from the data mesh architecture being relatively new in the market along with data fabric. With solid scores in definitions being understood and improving, this 23% should diminish with time.

Streaming IoT Data

The survey ranked streaming Internet of Things (IoT) data as the lowest of the data architecture trends being broadly adopted. However, it was not dramatically lower than the data mesh or the data fabric. In the most valuable over the next five years category, the streaming IoT data architecture ranked at 26%. Here we find that streaming IoT data is likely the least understood across industries as it ranked 30% in currently researching and trying to understand.

Streaming IoT data also ranked 23% for compelling business value, slightly lower than data fabric and data mesh. The impressions answer for positive - good as an IT open architecture came in relatively high at 36% and in second place in the ranking only to Real-Time Analytics, which is an interesting ranking. Looking at the valuable and suitable for enabling BI in the data science category, streaming IoT data drops to 12%. However, we can see that the general impression of streaming IoT data is relatively high. As a definition understood and consistent within the industry, it ranked relatively well, somewhat at 23% and improving at 36%. Understanding at the conceptual level came in second ranking at 25%, once again only behind Real-Time Analytics.

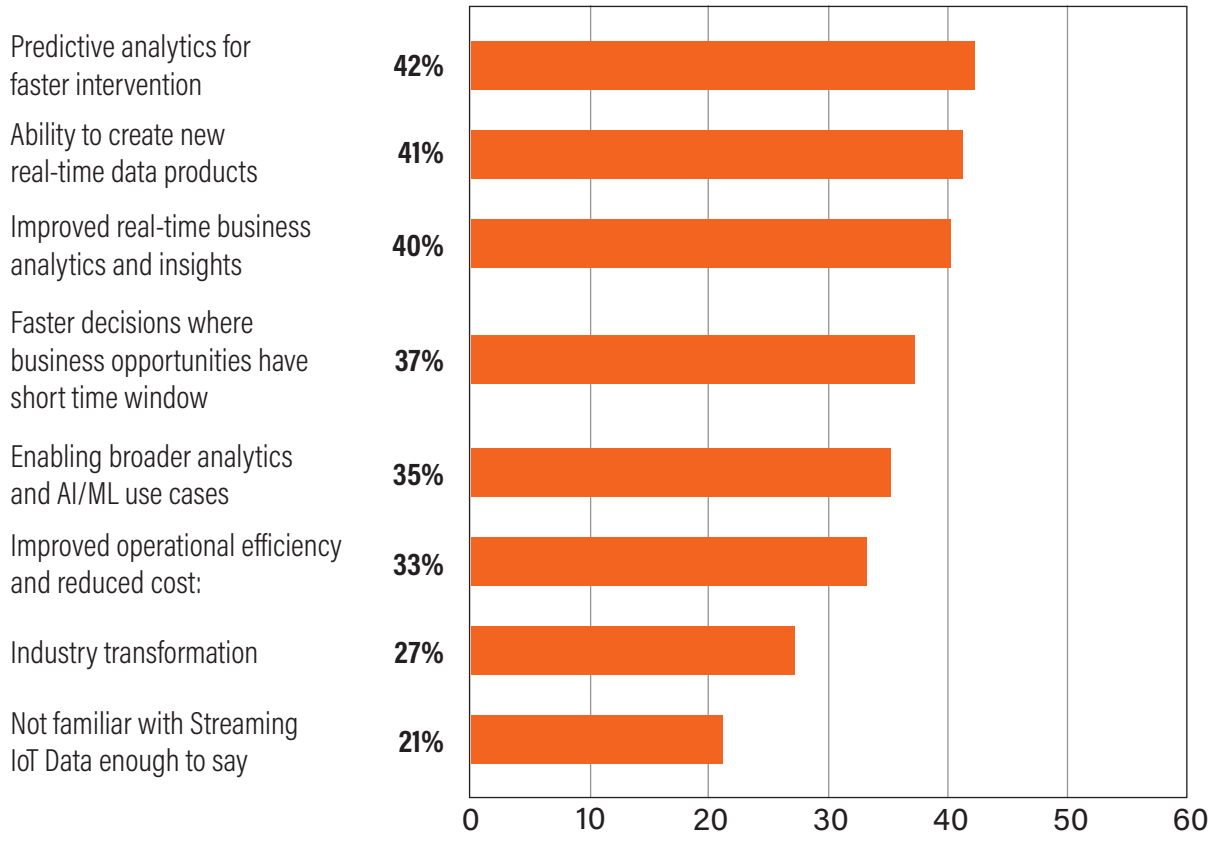
Figure 21. What do you believe are the challenges for a streaming IoT data initiative to overcome? (Multi-Select)



Examining the challenges that streaming IoT data needs to overcome, we find three groupings that only separate by a few percentage points. The highest challenge grouping is data security and privacy around IoT devices at 49%. As the leading challenge to overcome, respondents are likely to relate IoT devices to personal information, manufacturing or logistical sensors. The second highest challenge to overcome at 48% is the amount of data volumes and analytics performance in continuously streaming IoT data measurements from sensors into the data platform. In the next grouping, deploying and managing IoT devices and manufacturers is at 39%. This is a valid concern based on our research and at Radiant

Advisors. When a device function can be produced by multiple vendors with multiple models along with their updates and upgrades every year, managing the devices themselves and the data they produce is challenging. Like Real-Time Analytics, selecting a database capable of ingesting and analyzing real-time data is a concern. However, it should not be with the current databases available in the market and on the cloud. In our third category are the generalized concerns we have consistently found with the other data architecture trends. The compatibility of real-time analytics platforms with data management or analytic tools ranked 32%, and having or finding IT resources with necessary skills at 30%. Once again, we believe this is more of an awareness issue. These challenges have been reduced in recent years. The last category for "Not familiar enough with streaming IoT data to say" at 23% is likely related to a lack of broadly available research and education for streaming IoT data architectures.

Figure 22. What do you believe are business value outcomes for streaming IoT data initiative? (Multi-Select)



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As we drill into the business value outcomes for streaming IoT data, our first grouping is led at 42% by predictive analytics for faster interventions. This is likely related to manufacturing; however, predictive analytics for many companies could also be event-driven customer interactions or business transactions that allow predictive analytics to do the next-best action scenarios. This is followed very closely by the ability to create new real-time data products at 41% and improved real-time business analytics and insights at 40%. The second grouping is only a few percentage points lower for more generalized capabilities from streaming IoT data. Making faster decisions where business opportunities have a short time window is at 37%, followed by enabling broader analytics and AI and ML use cases on top of the streaming IoT data at 35%. Next is the generalized grouping for improved operational efficiency and reduced cost at 33%. As with the other data architectures, industry transformation comes in lowest for business value outcomes at 27%. Perhaps the respondents are not looking at IoT as an industry transformation but rather more of an evolution or enhancement. Like other emerging and new data architectures, the not familiar enough to say the response is 21%. This is consistent with the architecture trends that are not as well understood, or their compelling business value is as understood. Here we find that 20% to 25% of respondents are not familiar enough with the benefits and the business value outcomes to pick one of these selections.

Demographics Highlights

This market study was conducted in April 2023 and collected 210 qualified respondents through managed survey opt-out prompts. We were able to confirm the survey responses through twelve demographic questions. The demographics found in this study provided insights and aligned with what we were looking for in representation.

The leading respondent role was in the BI analytics and data warehousing role with 12.4%, followed closely by IT-related architects and database administrators at 11.9%. These roles are most likely looking at emerging modern data architecture trends. The following few roles were the IT-related director at 9.5% and the IT-related administrator at 7.1%. The next group of executives is split between the executive management group, with 6.7%, and business executive management, with 6.2%.

IT/Operations represented the highest department or function area at 25.71%, followed by IT/Architecture at 23.3%, then IT/Development at 17.62%. These IT departments are most likely leading the research and adoption of newer modern data architectures.

Company size by employee count mostly fell into opposite ends of our spectrum (smallest and largest employee count), with the largest category of less than 250 employees in company size at 23.8% and companies that have 20,000 or more employees at 19%. This is interesting because transforming data architectures is not trivial for companies with fewer employees. We have a similar representation of large organizations that likely have distributed organizations and a high number of data consumers. Also, there is no indication that data volume or velocity is related to the number of employees in an organization. Representation from six other company size groups varied between 250 and 20,000 employees ranging from 4.8% to 14.3%.

Industry demographics are from 20 industries from a list of 25. The top seven categories accounted for 60% of respondents. The finance, banking, and insurance industries were the largest group at 14.76% and are likely to have interests in real-time analytics, data governance, security, and predictive analytics. The high technology application group follows this at 9.52%, and the high technology software group at 9.05%.

While high technology is a generalized category, we can assume they represent digital interaction-oriented and customer-centric interests. Next is the healthcare, medical, and pharmaceutical group, at 8.57%, likely to have interests in data governance and security and AI and ML use cases. Education at 7.62% and manufacturing at 6.19% add to the diverse perspectives captured on this survey.

Regional demographics represent technology adoption, rate of change, and cultural aspects that can influence technology adoption. This survey was predominately North American representation at 51% of respondents. Both regions of EMEA and APAC are 15% each, followed closely by Latin America at 13% representation. The category for the Rest of the World represents 8% of survey respondents.

Annual sales revenue (ASR) is another influential demographic as it relates to the budgets provided by companies for initiatives in data and analytics. The $1B or more ASR group represented 29% of respondents in this survey. The second largest group of respondents is 16.7%, with ASR in the $100M to $1B. Therefore, the companies in this survey are 45.7% with $100M of ASR, 40.5% below $100M, 4.8% in government or non-profit, and 9.0% as do not know or unpublished.

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Figure 23: Which of the following best describes your role in the organization? (Single-Selection)

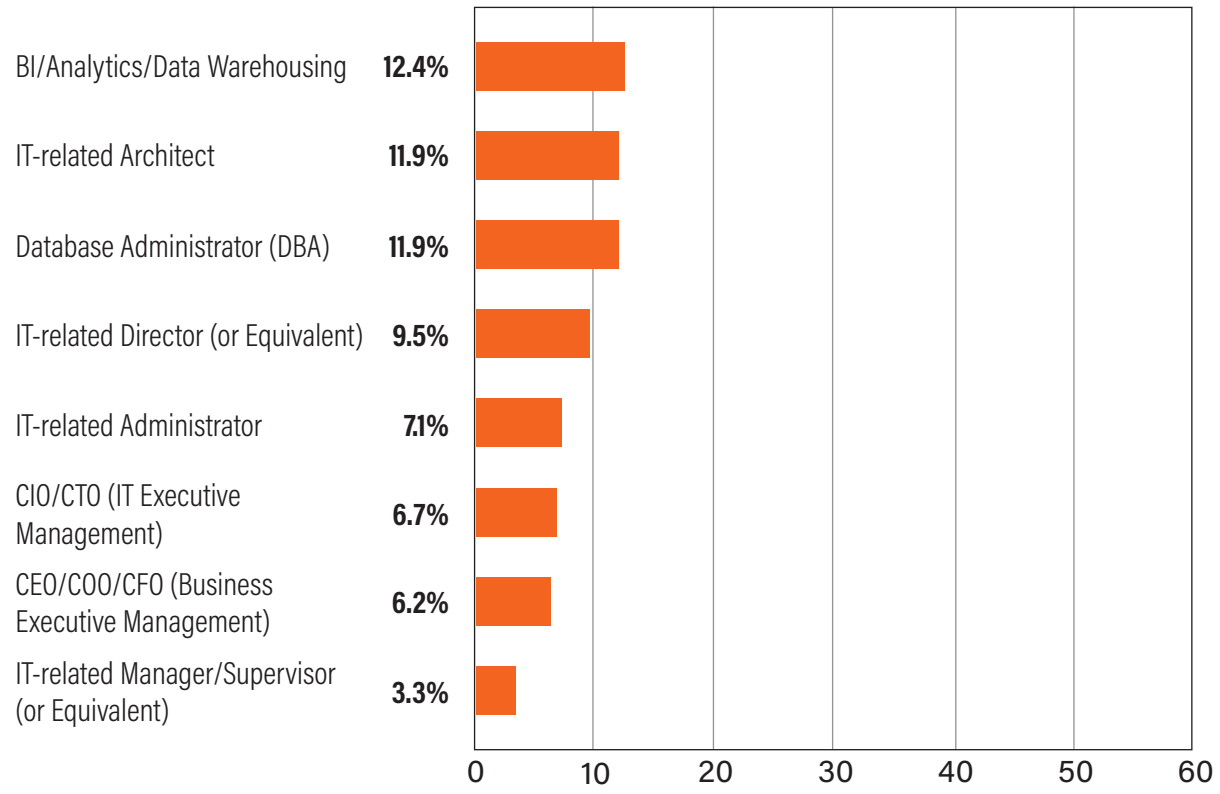

Figure 24. Which of the following best describes the department or functional area in which you work? (Single-Selection)

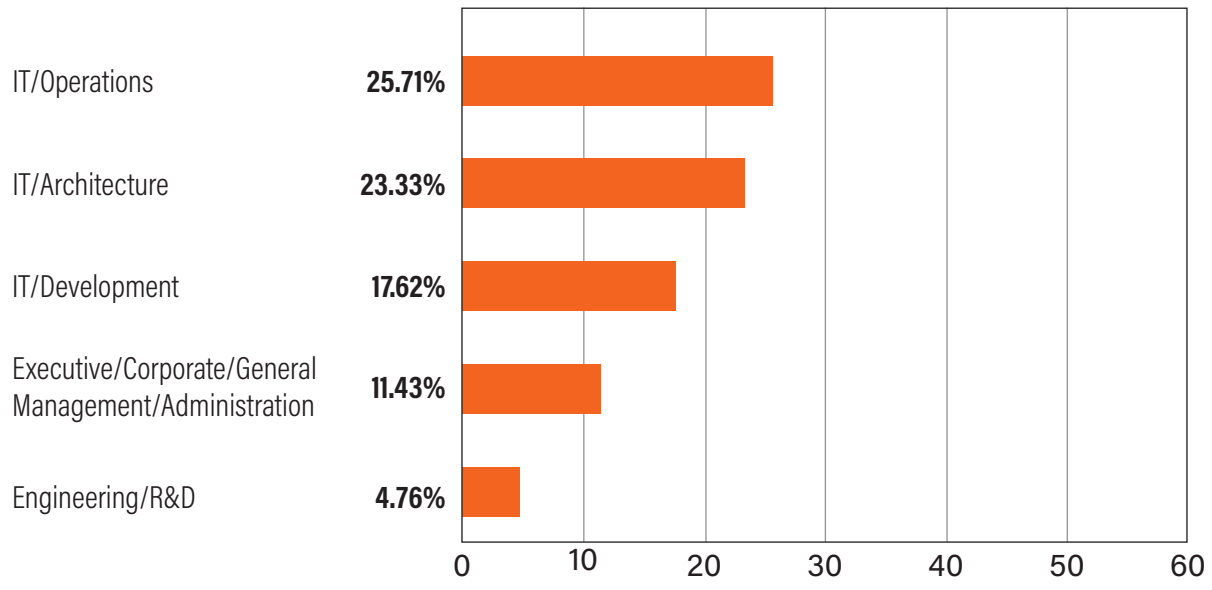

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Figure 25. How many employees are in your company worldwide? (Single-Selection)

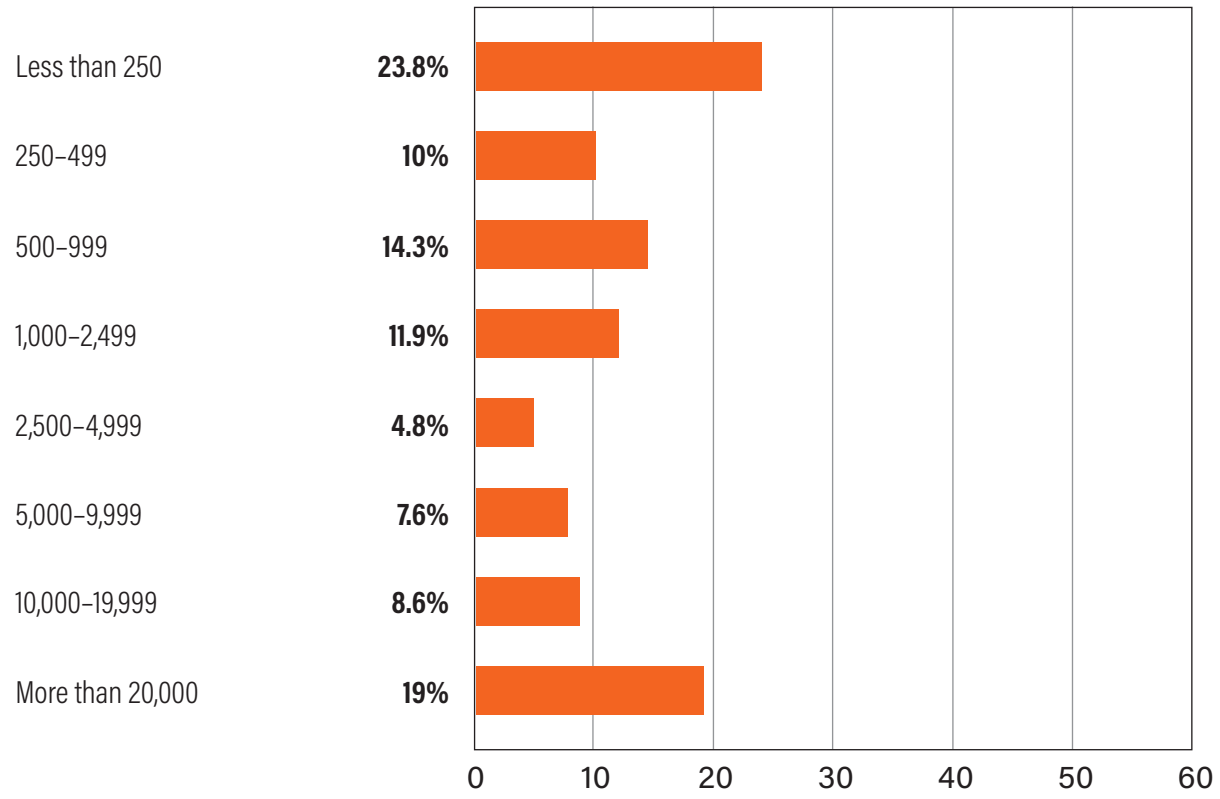


Figure 26. Which of the following best describes your company's primary industry? (Single-Selection)

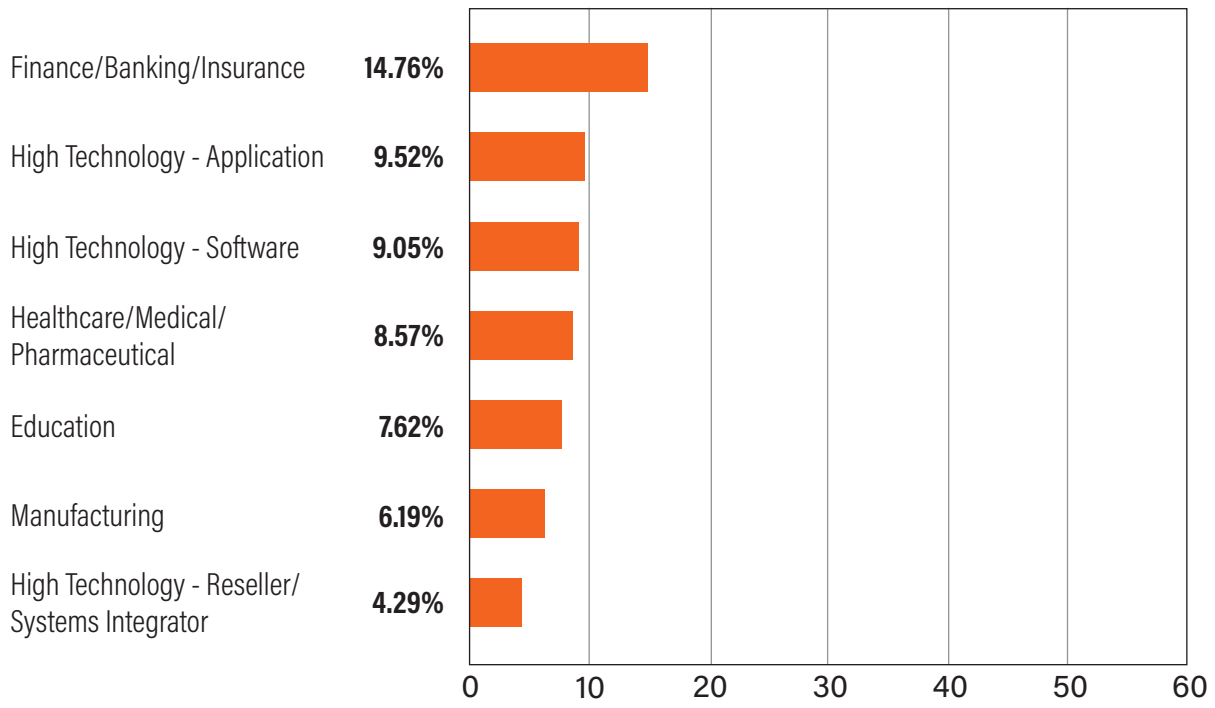


Figure 27. In which region(s) does your company have operations? (Single-Selection)

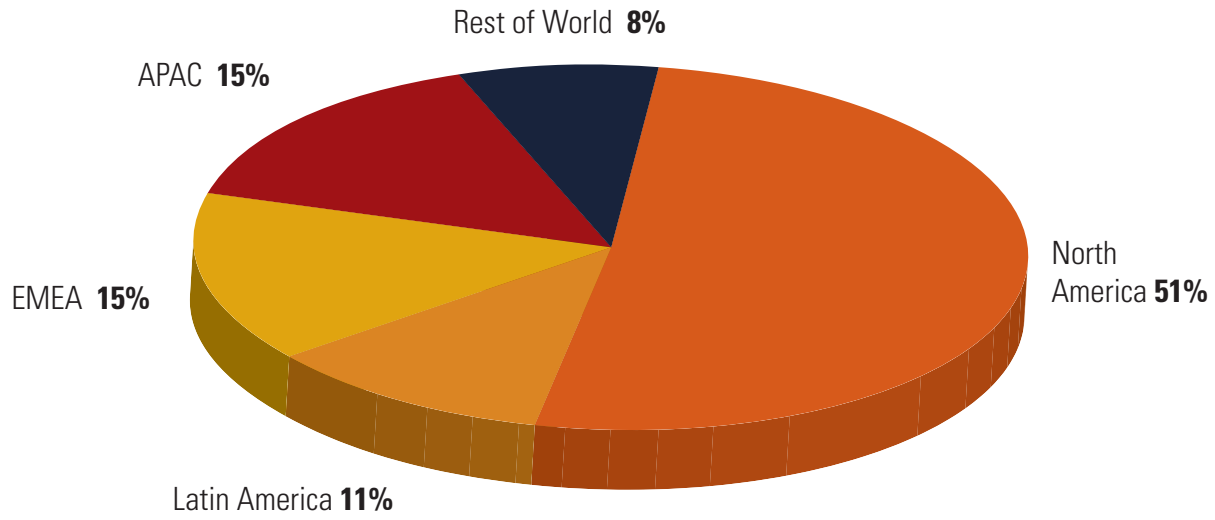
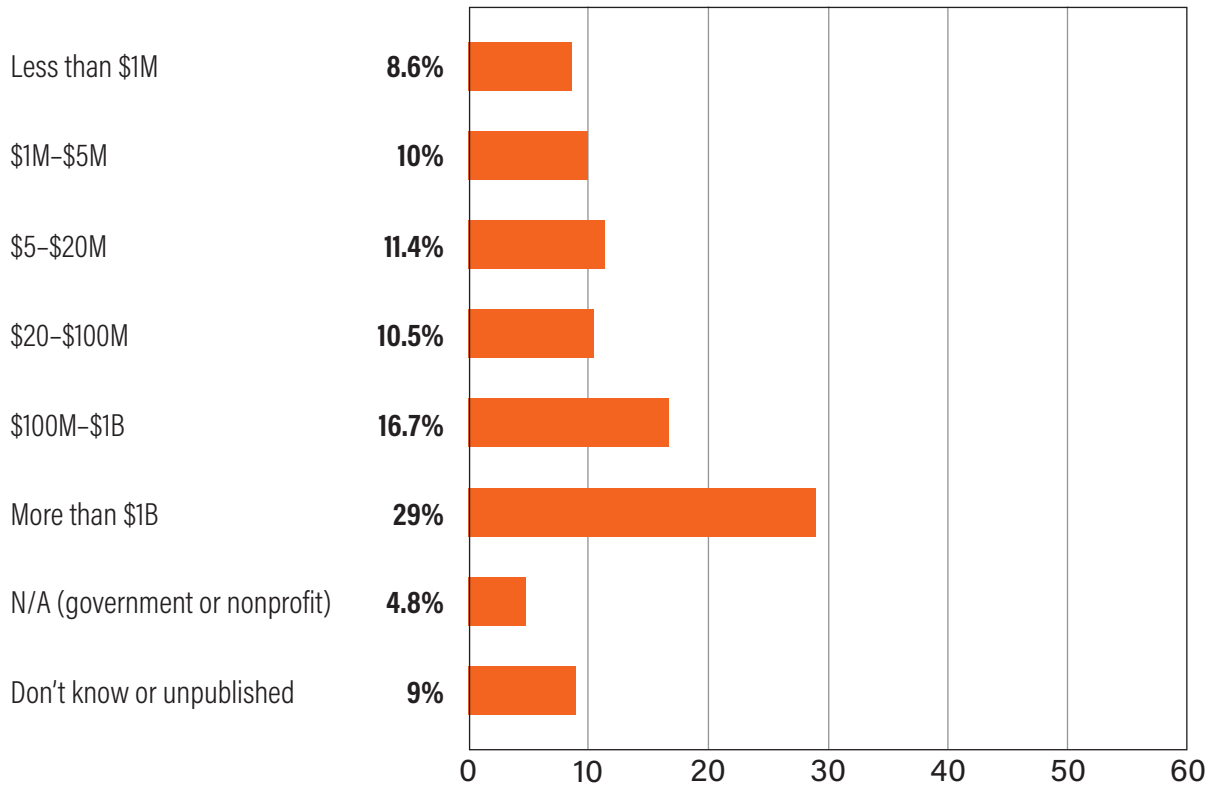


Figure 28. What is your organization's annual sales revenue? (Single-Selection)



What's Really Important when Modernizing Data Architecture

By Sam Chance, Principal Consultant at Cambridge Semantics

Contrary to popular belief, the most meaningful development in contemporary data architecture isn't the broadening adoption of the data mesh or data fabric concepts. It's actually the merging of these two approaches into a single architecture.

The reality is the similarities between the architectures for a data mesh and data fabric are almost greater than their differences. They're not competing constructs for making data available across (and between) organizations, but are complementary in achieving this objective. When properly implemented with semantic knowledge graph technology, they fuse into a two-tiered approach for devising reusable data products that span both business domains and the enterprise.

A Data Fabric, Compliments of the Data Mesh

At a high level, a data fabric can join (across an organization) the data products of a data mesh, which locally exist at a lower level. When those data assets are well described via semantic technology, organizations can unify these architectures while reducing costs, time to value, and ETL/ELT utilization by maximizing data reuse potential—while also increasing their capacity to exploit data relationships.

Semantic Knowledge Graphs Integrate Architecture Strategies

The semantic technology underpinning knowledge graphs are primed for data mesh and data fabric architectures—and their synthesis. They're certainly ideal for crafting data products.

Semantic technology excels at providing uniform, standards-based descriptions of data assets or products in business-friendly terminology designed for understanding and sharing them between users, systems, and applications. The crux of semantic technology is focused on sharing models of a particular domain. Domain experts can create these technologies so they can be reused by anyone requiring that data product—regardless if that's for a data mesh or data fabric.

Once you have semantically structured a particular data domain, it is as simple as finding a common shared semantically described data point in another domain to bridge two knowledge graphs into the first stitches of a Data Fabric.

The Two-Tiered Architecture: A Meshy Fabric

Conceptually, a better way to think about the data fabric and data mesh architectures is as two tiers of a common architecture. For the first tier, a data mesh is the bottom-up approach for this lower tier that's nearest the data sources. This tier is responsible for provisioning the data, which are described with rich metadata according to semantic standards to produce reusable data products from individual business domains.

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The data fabric is the top-down approach to the second or upper tier that's above the data mesh. As such, it integrates any data product across domains, locations, and datasets. This construct is pertinent for devising new data products by combining them across domains.

As such, a data fabric encompasses all business domains while still retaining the meaning of the parochial business ownership of those data assets. Therefore, **organizations benefit from the best elements of each architecture in one combined architecture.**

Flexibility As "Modern" Becomes "Traditional"

We're currently seeing the surge of generative AI (e.g. Open AI's ChatGPT & other LLM technologies) as a desirable tool for all business stakeholders, yet many data enterprise architectures and foundations are not built to take advantage of new innovations like this safely and easily.

Semantic knowledge graphs, being natural language-based by nature, fit perfectly into the new chat-based analytics world where an AI can follow paths connecting different data sources laid out by a knowledge graph's ontology. Ontologies used as a semantic layer, describe data in a way that is both human and machine readable. Ironically it is actually the human readable descriptions that also allow LLM's to automatically create queries that can be executed (using the machine readable dimension) against the knowledge graph in response to a user's questions.

Our version of this new reality we've dubbed the Knowledge Guru, a chat-based interface integrated with Anzo semantic knowledge graph data architecture. Knowledge Guru allows your organization to bring this new exciting generative AI world in-house in a safe manner, conforming to high Enterprise IT standards. This enables stakeholders to answer their own questions quickly, even if they need to chat it out with the Guru before truly knowing "what" their question is.

About Cambridge Semantics

Cambridge Semantics Inc. is a modern data management and enterprise analytics software company. Our solutions enable organizations in financial services, government, healthcare, life sciences, manufacturing, and retail to accelerate data delivery and provide meaningful insights enterprise-wide at hyper-speed and scale.

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Make Sense of Sensor Data

By Chad Meley, CMO at Kinetica

IDC forecasts that by 2025 there will be over 73 zettabytes of data from connected devices. Sensor data, which is inherently fast-moving time-series data, is increasingly becoming spatial

data as the cost of chips capable of sharing their location drops precipitously. Deloitte projects that by 2025, 40% of all sensor data will be location enriched, meaning the data sets will include

readings with timestamps and longitude and latitude. Similar to the rise of big data 1.0, where web data forced organizations to rethink their data management architectures to account for new requirements and data types, the era of location-enriched sensor data requires rethinking technologies and design patterns to harness value and control costs.

Kinetica was purpose-built to address the unique challenges associated with analyzing sensor data streams that require advanced time-series, spatial, and graph capabilities. Kinetica is a fully-vectorized, distributed, columnar, memory-first, Postgres compatible database with integrated time-series, geospatial, and graph functions.

Enterprises are drowning in IoT data and struggling to develop basic analytic capabilities to unlock value on streaming data sets from sensors and machines.

Getting value from sensor data requires:

- real-time analysis to seize perishable opportunities, yet conventional batch-oriented databases incur high latency that slows decision making
- fusing sensors on spatial and temporal dimensions, yet conventional databases struggle with these specialized join types that results in data hitting the floor or getting highly summarized
- invoking time-series, spatial, and graph, yet conventional databases provide only partial or rudimentary capabilities that yield less insights
- leveraging generative AI and vector similarity search to find hidden patterns, yet vector databases lack the above capabilities requiring extensive integration and data movement that adds latency and cost

Kinetica addresses all of these requirements, plus radically reduces compute, development, and maintenance costs.

Kinetica is designed to ingest and process large amounts of streaming data from sensors and machines, making it suitable for use cases such as real-time analytics and supporting machine learning inference. Kinetica includes built-in support for time-series, spatial, and graph, making Kinetica uniquely well suited for tracking and analyzing anything that changes status in real-time, such as fleets of vehicles, market prices and risk, goods in a supply chain, threats in our airspace, issues in 5g networks, and more. Ford, USPS, T-Mobile, Citibank, Lockheed Martin, The NBA, NORAD, and other organizations rely on Kinetica to deploy innovative real-time analytics.

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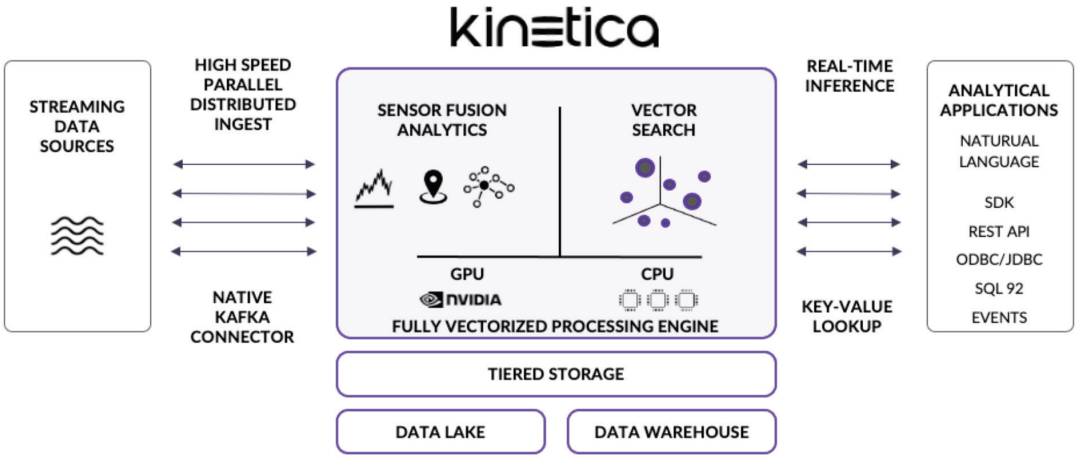
Kinetica uses a fully vectorized query engine to boost performance. This is in contrast to conventional databases which process data on a row-by-row basis, which is much slower and requires more computational resources. In a vectorized query engine, data is stored in fixed-size blocks called vectors, and query operations are performed on these vectors in parallel, rather than on individual data elements. This allows the query engine to process multiple data elements simultaneously, resulting in faster query execution and improved performance. In addition to improving query performance, this vectorized approach also reduces the amount of compute and data engineering required, making them more efficient and cost-effective. Because of the brute force compute advantages, many clients have significantly reduced or eliminated the need to create tedious data pipelines that incur costs and reduce analytic agility.



Key Capabilities:

- Real-time Analysis: The increasing need to provide fresh data when making decisions is driven by the fast-paced nature of modern business and the ever-growing amount of data that is being generated. Kinetica outperforms other databases as a result of distributed and headless ingest, native Kafka connector, lockless architecture, and vectorized query processing.
- Spatial & Time Series Analysis: Sensor and machine data (aka IoT data) is inherently time-series and increasingly spatial as a result of location aware chips, GPS, and the proliferation of satellites. Organizations may have siloed time series or geospatial tools but can't combine these genres of analytics to unlock value from sensor and machine data. Kinetica combines advanced spatial and temporal analytics along with generative AI that enables unprecedented insights.
- Lowest TCO: With Kinetica, you can avoid having to build out complex data pipelines to optimize data before it can be used. This in turn reduces the need for specialized data engineering, and time spent on maintenance and compliance. Kinetica takes advantage of modern CPU and GPU architectures to more efficiently perform complex operations such as filtering, grouping, and aggregating data, on a smaller compute footprint. Kinetica's customers have been able to drastically slash the number of nodes needed for analytics.

Try Kinetica free or contact Kinetica to learn more.

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Top Data Architecture & Engineering Trends to Look Out for in 2023

By Rudra Ray, Director of Technical Marketing, Informatica

It's no secret — data architecture is *always* evolving. Staying ahead of the curve is one of the primary challenges of being a successful data architect and engineer. By taking advantage of new technological trends, you can simplify data pipelines, reduce costs and extract more value from data, all necessities to effectively compete in today's digital economy. Here are three critical trends every modern data architect and engineer should know.

1 SIMPLIFY DATA MANAGEMENT WITH DATA MESH

A domain-driven analytical data architecture treats data as a product and is owned by teams that consume data the most. In a data mesh architecture, data warehouses and data lakes are treated as nodes by the data domain on the mesh rather than the central point of the overall architecture.

As the need for real-time, data-driven decisions becomes more critical, many organizations require data to have business domain-specific ownership. This enables data product owners to better manage and decide how their data is used. It also encourages teams to share data, instead of simply copying it, and provides better visibility into where specific data is being used across the enterprise.

2 CONNECT THE DOTS WITH DATA FABRIC

A data fabric integrates and connects all your organization's data intelligently and efficiently by abstracting underlying complexity. It minimizes disruption by enabling a highly adaptable data management strategy. Data fabric is agnostic to deployment platforms, data processing methods, data delivery methods, locations and architectural approaches. It can help enable faster data-driven decisions through automated data management and broader data sharing, as well as optimize data integration and data preparation to improve productivity in a cost-effective manner.

3 INCREASE EFFICIENCY WITH A MODERN DATA STACK

A modern data stack (MDS) refers to the technology and tools that are used to collect, process and store data in modern data and analytics. MDS brings many benefits to data architects and engineers, such as greater efficiency, faster and more affordable ways to validate hypotheses and reduced technical debt and frustration. When upgrading to an MDS, look for the following characteristics: scalability, seamless integration with other tools and easy deployment.

To know more about modern data architecture trends, please refer to the Modern Data Architectures for Dummies Guide. Let's see how one of these data architecture trends can be applied in a real-world use case.

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BMC TURNS DATA CHAOS INTO DATA CLARITY WITH THE POWER OF DATA FABRIC

BMC Software (BMC) was using decentralized, manual processes for their accounts payable and generic ledger operations. This caused a lack of standardization across countries and affected the treasury team's ability to see current account balances. As a result, BMC had to maintain excessive cash reserves to cover any unpredicted cash needs.

Working with Informatica, BMC was able to rapidly build a functional system using a data fabric. They added advanced capabilities for improved visibility into actual and projected cash flows. This allowed BMC to right-size their cash position and optimize their working capital. As a result, BMC saved hundreds of thousands of dollars and gained better reporting and control across hundreds of bank accounts. Accurate visibility into their holdings improved risk management and mitigation strategies.

UPGRADE YOUR DATA ARCHITECTURE

Informatica was recently ranked the #1 data engineering vendor. We bring data to life by empowering businesses to realize the transformative power of their most critical assets. When properly unlocked, data becomes a living and trusted resource that is democratized across the organization, turning chaos into clarity. Through the Informatica Intelligent Data Management Cloud™ (IDMC), companies are driving bigger ideas, creating improved processes and reducing costs. Powered by CLAIRE®, our AI engine, it's the only cloud dedicated to managing data of virtually any type, pattern, complexity or workload across practically any location — all on a single platform, with a simple and flexible consumption-based pricing model. **Informatica. Where data comes to life.**

Informatica can help you build an advanced data architecture. Contact us.

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Teradata

Business Challenges and Benefits

The flexible use of data and faster analytics performance are huge accelerators in today's business environment — leading to major competitive advantages. Teradata provides the following to address the challenges businesses face:

- **Faster innovation:** improve your analytics capabilities to surpass the competition in powering AI/ML operations
- **Improved customer experience:** realize the autonomy, visibility, and insights you need to keep pace with customer demand
- **Cost effectiveness:** gain full visibility and control over your analytics usage to manage and allocate costs better
- **Predictive performance:** deliver answers from IoT data to proactively identify opportunities to optimize assets and avoid costly failures
- **Operational excellence:** optimize supply chains and manufacturing processes by delivering answers that improve efficiencies
- **Risk mitigation:** leverage advanced analytics (e.g., artificial intelligence, machine learning) to predict and prevent fraudulent activity.

Who is Teradata?

Teradata offers the complete cloud analytics and data platform for all enterprise use cases. By delivering harmonized data and trusted AI/ML, Teradata empowers people with better information to make the right business decisions — inspiring the confidence to take action and making the world more connected. Teradata's industry-leading innovation and proven hybrid, multi-cloud platform improves business performance, ensures better customer experiences, and drives profitable growth with the speed, flexibility, and scale that businesses need — all at the lowest TCO.

Teradata Vantage Overview

Central to Teradata's business is Teradata VantageTM, the modern data management platform for enterprise analytics. Vantage provides fast and flexible access to data no matter where it lives and adapts as your business needs change. Teradata's industry-leading ClearScape Analytics capabilities offer the most comprehensive, end-to-end pipeline of AI/ML functions, integrations, and implementation features to quickly answer complex questions and definitively deliver actionable results.

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Teradata Vantage is a highly adaptable data analytics platform, built to deliver the power and flexibility modern businesses need, with more control, less risk, and no lock-ins. Vantage offers the ability to:

- **Unlock Data** – Vantage connects more data to harness deeper relationships across an organization. Through massive multiway joins of data and a cohesive, intelligent data fabric that spans multiple systems, Vantage distributes processing, minimizes data movement, and enables deep insights from your data.
- **Activate Analytics** – With support for real-time data streaming and the ability to run and manage complex analytic pipelines directly within the database, Vantage operationalizes solutions for sophisticated analytic challenges at scale, yielding rapid business results.
- **Accelerate Value** – Everything in Vantage is parallelized, from the movement of data to the processing of machine learning models. With its industry-leading, cost-based query optimization and workload management capabilities, Vantage offers significant value for your investment.

Modernization Workshop

Ready to take the first step towards unlocking the true potential of your data and analytics ecosystem?

Get started with our Modernization Assessment for a comprehensive assessment that evaluates the maturity of your current setup and provides a Modernization Roadmap tailored to your cloud environment. Our experts identify opportunities for analytic advancement, recommend modern approaches for data platform operations, and outline strategies to enhance real-time access to data in the cloud.

Request your Teradata Modernizaton Workshop today.

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Data analytics trends for 2023

VERTICA by opentext™

Data remains one of your company's most valuable assets, whether you're building a business around it, or using it to discern patterns and trends, develop predictive insights, improve customer engagement, or track consumer behavior that can lead to a real business breakthrough.

According to analyst firm Gartner,[1] companies increasingly rely on data-driven decision-making, which is no doubt the reason the data analytics market is growing at 30% CAGR.[2]

Gone are the days when a business leader's instincts and experience are the primary basis for decision making and predictions.

Speaking of predictions, here are four that OpenText considers near-term for 2023.

1 Embedded analytics will continue growing, including edge computing.

First adopted by IT operations teams as a way to more quickly see and resolve problems in core IT systems, embedded analytics has grown in popularity across numerous industries, including automotive, retail, financial services, and many more. And for good reason. With analytics technology embedded directly into software applications, anomalies can be spotted immediately, as well as conditions that require maintenance. Financial institutions can better enable fraud detection, health monitoring systems can detect abnormal changes in heart rate, for example, in time to save lives.

At the same time, the volume of machine generated IoT data has grown logarithmically, which has upended traditional data processing models that assumed data would be centrally analyzed. Today we find that a robust, decentralized computing model – called "edge computing" or sometimes "fog computing" – provides AI and decision-making intelligence at the data source.

The advantage of adopting an edge computing model is primarily the speed of analytics, since data does not have to be uploaded from a source for analysis. In turn, this means faster decision making. Another term for all the above examples is "micro analytics," which places the results and ability for decision-making closer to the user of a device or the manager of an IoT-based deployment.

2 As analytics becomes more pervasive, it will become democratized and composable.

Analytics will keep pace with the growing demand for business intelligence (BI) and situational awareness. Analytics leaders will build systems that can expand and shrink with seasonal cycles, or as data projects come and go within business units across the enterprise.

All business units (even non-technical ones) will eventually have access to data and intelligent insights. Cloud architectures and on-demand analytics platforms will grow and deliver functionality to meet the demand, and the need to manage the cost of this will lead to more composable technologies.

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Gartner believes 60% of organizations will use analytics technologies that are composable. In other words, organizations will fuse components from multiple analytics solutions to build business applications that provide a richer view of their data.

3 More organizations in 2023 will operationalize analytics and AI

Since 90% of collected data is unstructured, it is very hard to process in terms of analytics. And there is simply so much data that it's difficult, and expensive, to store.

Machine learning capabilities are beginning to help with that problem. As more businesses find ways to analyze this unstructured data, they're able to justify the storage costs since data is finally proving its value. ML is helping teams find patterns and trends in the data that before were invisible, and the technology is making these findings with nearly at nearly 95% accuracy against unstructured data.

4 The data fabric will offer more universal data access and utility.

A combination of traditional data sources and modern analytical capabilities is giving rise to the "data fabric," which gives whole organizations the ability to unify data even when systems that are physically or logically different. Disparate data sources can include multi-cloud sources, social media, edge sources such as IoT deployments, on-premises sources, mobile applications, and more.

The data fabric can ensure that metadata accompanies all data points collected, which offers analysts the critical context to make data meaningful. Metadata establishes the relationships between multiple kinds of data, which can lead to comprehensive and actionable business insights.

Conclusion

OpenText Analytics and AI enables organizations to extract maximum value from 100% of their data, whether they need BI and visualization, data mining, automated data discovery, unstructured, or structured data analysis. Our goal is to provide our customers access to any data, for any analytics, at any scale. Whether their analytics is on-premises in a data center, on one or more clouds, or a combination of both, our customers are able to optimize their analytic workloads, plus reduce their time and budget while gaining superior analytic insights.

To learn more, please visit us at OpenText AI & Analytics, and at the websites for our newly acquired technologies Vertica and IDOL.

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[1]https://www.gartner.com/en/topics/data-and-analytics
[2]https://www.precedenceresearch.com/data-analytics-market

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