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Modernizing the Data Warehouse: Challenges and Benefits

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Dear data enthusiasts,

With the pace of technological advance in 2019 it surprises many to find out that data warehousing, a capability that is no longer just a system of record but a tool for differentiation, is so slow to catch up. Unicorn companies capitalise on this lethargy by developing data-driven, automated applications that run the business – Uber owns no cars and Airbnb own no property, yet their real-time use of data allows them to earn billions.

However, the reality for many companies is a continued reliance on manual methodologies from the 1990s: hand coding, green screens and ETL; paying millions for on-prem databases that cost the earth and are hard to migrate from; taking months on tasks that can now be completed in a matter of hours.

This research gives statistical evidence and puts the BARC stamp on concepts we've been evangelizing for some time. In order for companies to succeed today, we must automate repetitive manual tasks that force too many developers to solve puzzles and fight fires arising from outdated tools and methodologies. Only then can companies focus forward on innovation and agile collaboration to supply reliable data to the business at the right time.

Now we are finally starting to see shoots of change, as CEOs are treating Data Warehouse Modernization projects with an urgency we have not seen previously. The number of CDOs appointed is growing, so now for many companies data is not just another responsibility on the CTO's busy schedule. Rather than a siloed collection of teams doing their own thing with different tools and methodologies, data is beginning to be viewed holistically with a company-wide strategy, and more often than not automation holds the key.

In the last few years Data Automation technology has really 'crossed the chasm' into the mainstream. Leaders no longer see automation as a nice-to-have luxury, but a necessity to compete in an increasingly data-centric market. As this report shows you, laggards are those who are yet to embrace the effective and proven technology at their fingertips. Data Automation technology is mature and enterprise ready.

Every day we have conversations with passionate data warehousing professionals who are tired of working manually when they know there's a better way. Hopefully this report makes more decision-makers aware of the need for change and sparks productive conversations across EMEA.

We're delighted to support BARC and be part of this research in a field we are very passionate about. Enjoy the report!



Rob Mellor (GM & VP, WhereScape EMEA)

Modernizing the Data Warehouse: Challenges and Benefits

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Retrofitting the aging tanker for an agile future

Data warehousing is getting on in years. Concepts and architectures have been applied more or less unchanged since the 1990s. However, data warehousing and BI applications are only considered moderately successful. Users criticize the inadequate benefits, quality, efficiency and effectiveness. Especially in times of rapidly changing markets, decision-support systems should promote the quickest possible knowledge growth. Advanced analytics and new ways of working with data also create new requirements that surpass the traditional concepts.

Many companies are therefore forced to put these concepts to the test. But what are the right measures to make the data warehouse and BI fit for the future? Are technical changes sufficient? What role do technology and IT infrastructure play? Can the basic nature of the data be proactively improved? What challenges must be expected?

This global survey provides insight into the current status of data warehouse modernization. The participants come from companies of different sizes, industries and locations around the world, with 77 percent based in Europe. People from BI and analytics teams, business units, IT, corporate management and external consultant teams took part.

Data warehouse implementations can differ immensely depending on factors such as scope, age and maturity. Existing challenges to be addressed as well as approaches and technologies chosen by modernization initiatives will vary depending on the current state. Therefore, we sought to characterize the status quo of survey participants' current data warehouse and analytics environment.

The biMA study, conducted in 2017/18 by Sopra Steria with the support of BARC, evaluated BI and data maturity based on a five-level model. These levels are described in chapter “Leaders target agile and interoperable data services based on a flexible data and process architecture”. Throughout our analysis we gathered insights depending on the current maturity level. We then grouped the five maturity levels into three groups that are referred to throughout this survey:

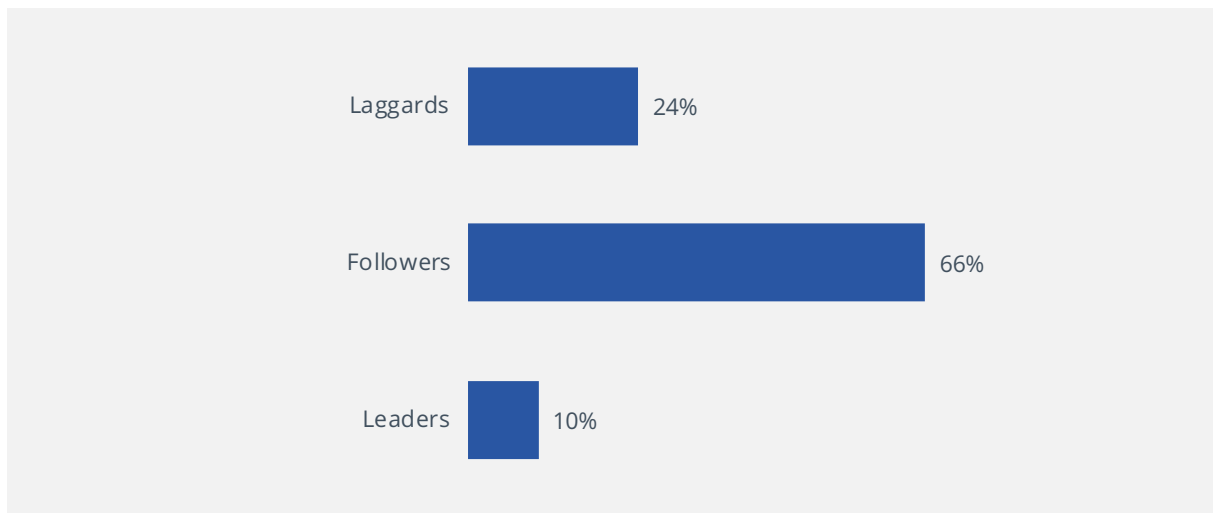


Figure 1: What is the best way to describe your data warehouse and analytics environment? (grouped, n= 389)

The largest group is clearly the followers. This corresponds to the average rating outcome of the biMA study in 2017/2018.

Management summary

A time-consuming development process and restricted support of self-service BI are the major drivers for modernizing the data warehouse.

The most pressing issue for 44 percent of survey participants is a lack of agility in the data warehouse development process. It is noteworthy that business users in particular consider the inability to provide required data and the lack of user acceptance as even more important than enhanced self-service. In particular executives (31 percent) and BI/analytics teams (30 percent) agree that software licenses are too expensive in general. Interestingly, neither poor compliance capability nor insufficient technology or functionality are seen as major challenges.

The primary modernization approach is data warehouse/ETL automation, which helps promote broad usage of the data warehouse but can only partially improve efficiency in data management processes.

Data warehouse/ETL automation as the most common approach corresponds with the most commonly deployed technologies, which are data integration and data warehouse automation tools. Benefits include broad data warehouse usage and the ability to handle a larger variety of data to support enhanced analytic requirements. However, an automation approach alone is of limited usefulness when data management processes are inefficient. The data landscape and the data integration tasks to be solved are often too complex.

Leaders rely less on data mart deployment than on lean, flexible architectures and usable data based on cloud services, a complementary data lake, data governance, data hubs and data catalogs.

Leaders choose different approaches and technologies from those of followers and laggards. Leaders obviously strive towards a leaner architecture and a flexible infrastructure. They focus less on data marts, tend to extend the data warehouse with a data lake and utilize analytic databases and real-time processing more frequently. They are opting for cloud services more prominently. While there is agreement that documentation promotes broader and more efficient use of the data warehouse, the wider adoption of data catalogs by leaders seems to indicate a missed opportunity.

Hot Spot 1



Hot Spot 2



Hot Spot 3



The evolution towards agile, interoperable data services is driving improvements in the ability to meet new requirements.

As companies evolve from an integrated data warehouse infrastructure to an enhanced, service-oriented data architecture they learn to adapt to new and changing requirements. Companies that have embarked on this journey are using lesser-known advanced approaches and technologies. For example, varied data types are handled with new data modeling approaches supported by appropriate tools. Data virtualization and data hubs make it possible to access data sources faster and more flexibly. Investing in Hadoop, Spark and NoSQL technologies pays for itself by improving the ability to handle a good variety of data with microservices, API management and containerization, improving deployment flexibility.

Hot Spot 4



The transformation from a complex and inefficient data landscape with inadequate data governance to a holistic and agile data architecture requires clear management support and the development of specific data skills.

The top four challenges companies face in modernizing their data warehouse environment are primarily related to organization: processes are not agile enough, there is a lack of skills in the business and IT areas and weak data governance results in growing complexity. However, changes in these areas cannot really be accomplished without management support, which is also lacking. Data must become a C-level priority. We must invest consistently in data and analytics literacy, but this also entails a cultural change.

Hot Spot 5



The most important trends aim at more efficient, effective and agile data management based on data governance, automation and self-service.

Empowering an organization to be data-driven requires efficient, effective and agile data and analytics processes. This requires usable, quality-assured data. Recurring tasks must be automated, and this applies to data provision as well as reporting and analysis. Creative work with data must be supported with user-friendly self-service, which includes providing a data catalogue to make data easy to find and use. Machine learning can help to automate manual tasks.

Hot Spot 6



Which Challenges in the Data Warehouse Environment Require Action?

By far, survey participants named a time-consuming development process as the most common barrier in the data warehouse environment. With 44 percent, it was rated much higher than restricted support of self-service BI (35 percent) and the inability to provide required data (30 percent). It is interesting to note that inability to meet compliance and regulatory requirements was seen as a major challenge by only 14 percent of participants. Even fewer chose insufficient technology or lack of functionality (11 percent). This is a common finding in many of our surveys. Apparently, technology has reached a sound level of maturity. The true success factor lies not in the technology itself but rather in how and under which circumstances it is deployed to meet business requirements. Only 6 percent reported to have no challenges at all.

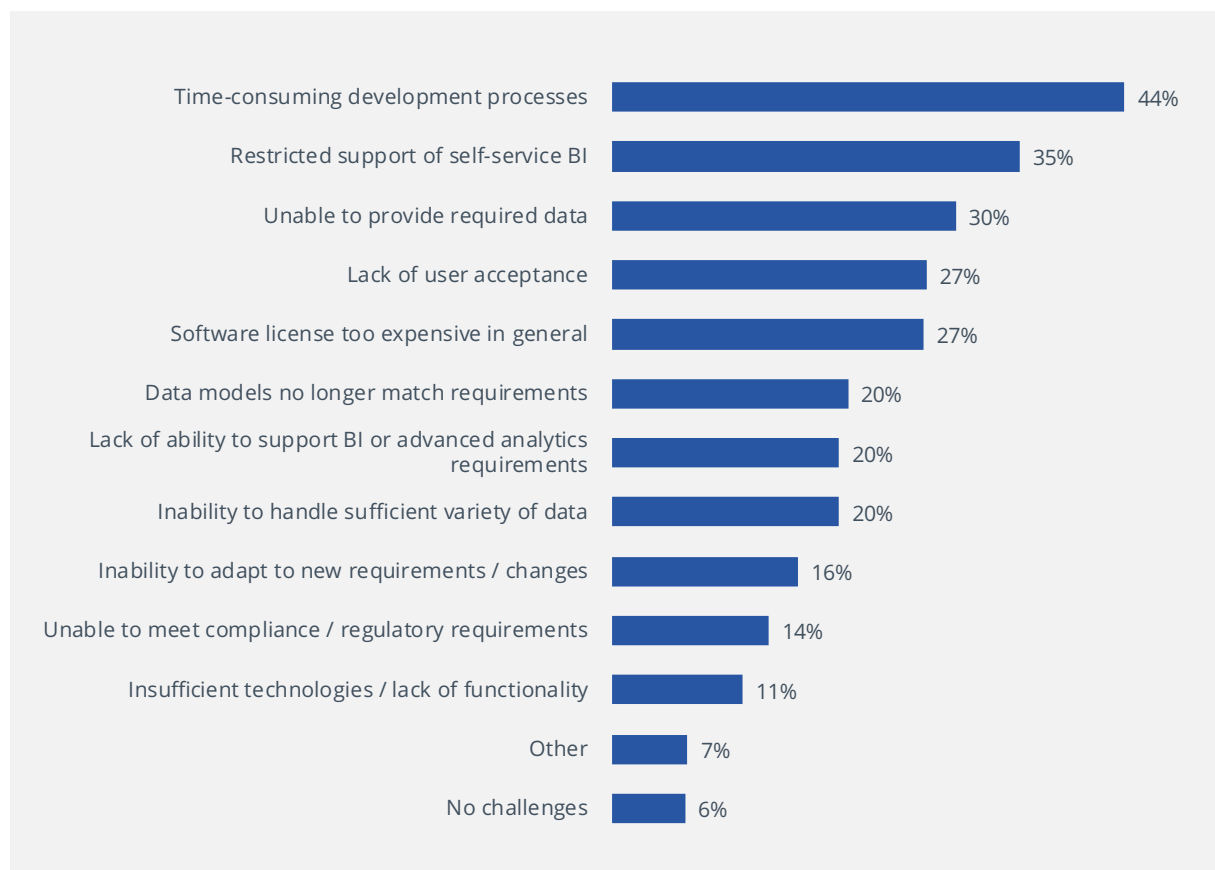


Figure 2: What challenges do you currently face in your data warehouse environment? (n=396)

More detailed analysis reveals some diversity in the participants' perspectives based on their position in the enterprise. Individuals from the line of business (LoB) see the inability to provide required data (42 percent) as more important than restricted self-service support (32 percent). In general, executives, IT

departments and BI/analytics teams see limited self-service capabilities as somewhat more problematic than LoB users do. Both business users and executives regard lack of user acceptance (32 and 30 percent, respectively) as an important issue. Executives (31 percent) and BI/analytics teams (30 percent) agree that software licenses are too expensive in general. At bottom, however, a time-consuming development process was identified as a significant hurdle to success by most participants of all roles.

The Primary Modernization Approach is Data Warehouse/ETL Automation

Data warehouse and ETL automation is a common improvement in data warehousing. A majority (60 percent) of respondents have implemented this approach. This corresponds to data integration and data warehouse automation topping the list of technologies utilized (42 and 37 percent, respectively; see figure 4) in modernization efforts. It is interesting to see that the data warehouse/ETL automation approach is somewhat more popular with leaders (51 percent) and especially followers (65 percent) than with laggards (48 percent). In contrast, leaders do not base their modernization initiatives on data integration technology as frequently as the other groups (35, 49 and 60 percent, respectively).

Data warehouse/ETL automation is the most important approach to modernizing the data warehouse. Correspondingly, data integration and data warehouse automation are the technologies most frequently utilized.

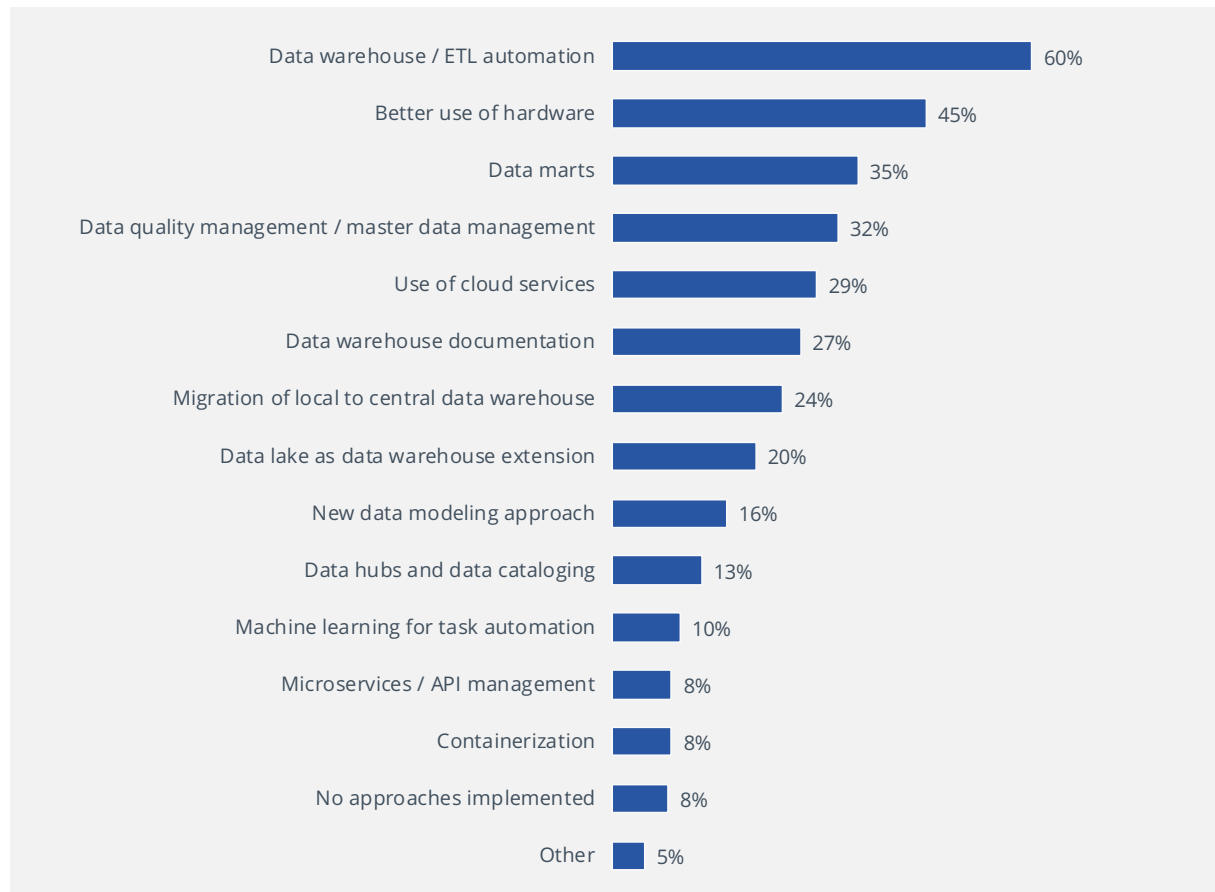


Figure 3: What kind of approaches have you implemented to modernize data warehousing? (n=393)

The second highest rated approach is better use of hardware (45 percent). By comparison, only 29 percent chose use of cloud services, which are commonly regarded as a promising alternative with regard to resource and cost efficiency of hardware. It is noteworthy that respondents in North America have acknowledged this, rating the use of cloud services as the second most popular approach (41 percent compared to 25 percent in DACH). For leaders, cloud services likewise play an important role (46 percent).

Implementing data marts is the third most popular approach, chosen by 35 percent of participants. This roughly corresponds with the usage of data modeling tools (31 percent), although this technology is less important for followers. In general, data marts are by far more popular in DACH (43 percent) than in NA (24 percent). Compared to established best practices in data warehousing, this does not appear to be a specific modernization task. In fact, some organizations are struggling to reduce data mart proliferation along with overall complexity in the data warehouse environment. Technological advances in analytical databases, data virtualization and in-memory computing can play an important role in preventing unnecessary data mart expansion. For leaders (26 percent), data marts do not play as important a role in modernization as for followers (37 percent) or laggards (34 percent). Having central enterprise data warehouse appears to be more important for leaders, as 30 percent migrate local data warehouses to a central approach. On the other hand, leaders use analytical databases much more intensively than others (41 percent compared to 27 percent overall).

Leaders choose other approaches for DW modernization than followers and laggards: leaders focus more on use of cloud services and migrating to a central DW approach based on analytic databases and real-time processing than on data mart expansion.

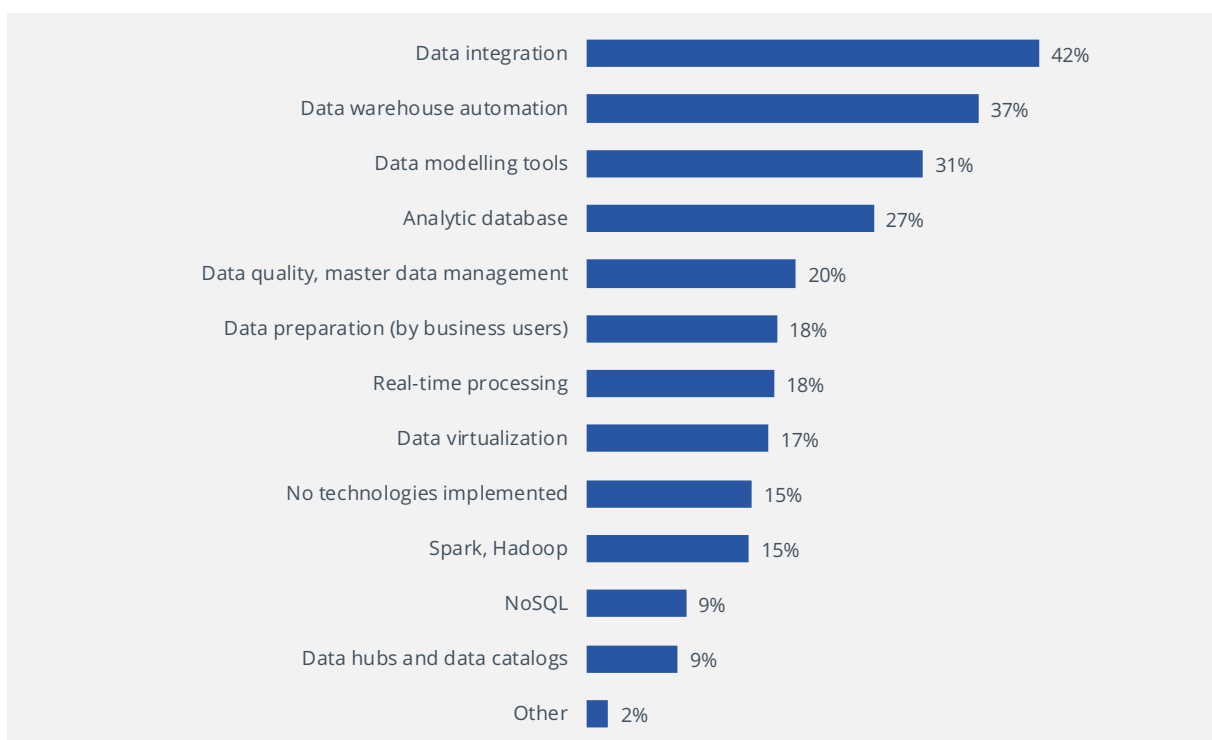


Figure 4: What kind of technology have you implemented to modernize data warehousing? (n=388)

Data quality (DQ) and master data management (MDM) has been rated as the most important BI and data management trend in the BARC Trend Monitor for three consecutive years. No surprise that this approach was chosen by 32 percent of respondents. At the same time, supporting technologies were only utilized by 20 percent. This may indicate that for DQ and MDM initiatives, either organizational measures are preferred above technology-based implementations or that awareness is lacking concerning the effectiveness of technology in support of DQ and MDM.

Data warehouse documentation appears to be a useful action for 27 percent of respondents. Documentation can help speed up development and therefore improve adaptability to new requirements. It can also help business users understand the available data and reports, driving user acceptance and the use of self-service BI. In contrast, the data cataloging approach is being implemented by only 13 percent, supporting technology by only 9 percent. Data catalogs and data hubs have proven useful for many enterprises. Detailed analysis shows that respondents with a very mature data warehouse environment (agile, interoperable data services) follow this approach more frequently (40 percent) than average. This may well be a missed opportunity for other environments.

There is common agreement that documentation promotes broader and more efficient use of the data warehouse, while the limited utilization of data catalogs indicates a missed opportunity.

Real-time processing plays a modest role on average. However, this type of technology is one of the most important for leaders (41 percent). This is understandable, since real-time processing is one of the most important prerequisites for decision automation and is an important foundation for agile, interoperable data services.

Lastly, Spark and Hadoop apparently do not play an overly significant role in data warehouse modernization. This is somewhat in contrast to the discussion in the market. However, when applied these technologies boost the ability to handle a good variety of data.

Wider Use and Self-Service Enablement Are Substantial Benefits of Data Warehouse Modernization

The foremost benefit participants achieve with their modernization initiatives is broader use of the data warehouse (44 percent).

Data Warehouse/ETL automation, the most popular approach to modernizing the data warehouse, helps promote a broader use of the data warehouse and improves the ability to handle a good variety of data.

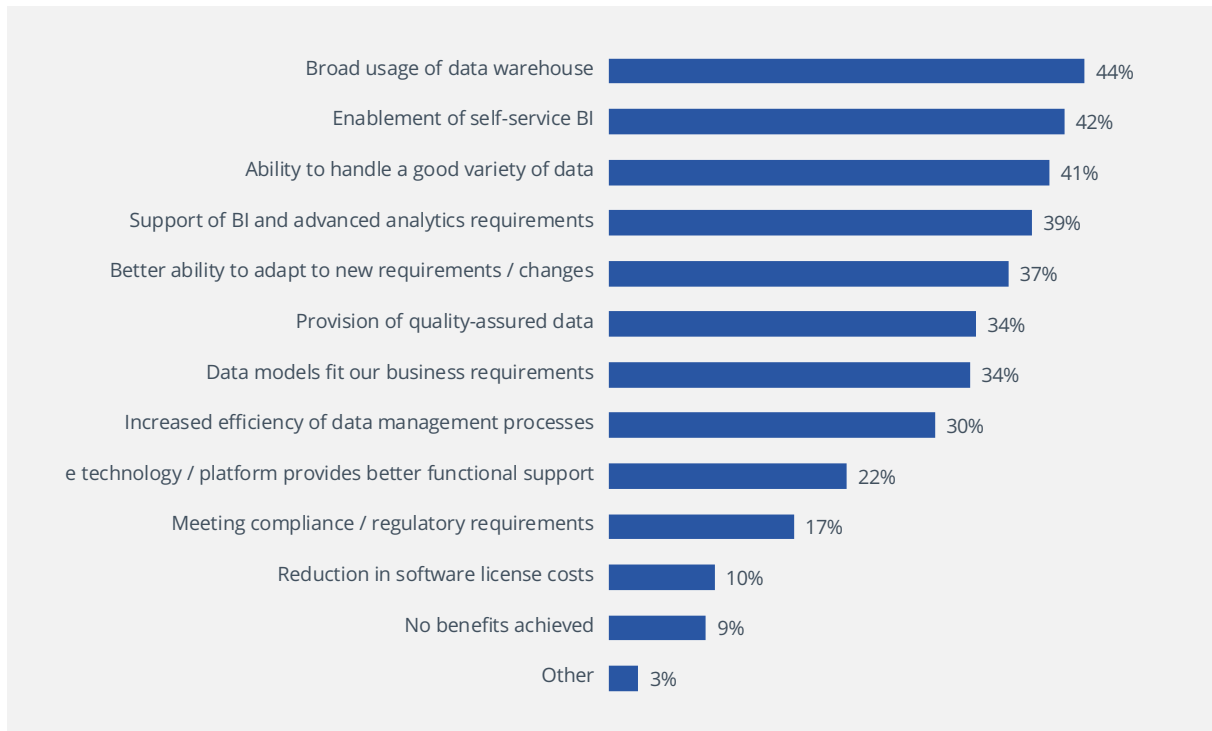


Figure 5: Which benefits have you achieved by implementing these technologies or approaches? (n=365)

Migration of local data warehouse implementations to a central enterprise data warehouse was not an overly popular measure (24 percent, see figure 3). However, when applied this approach mostly contributed to increased data warehouse utilization (60 percent). According to the survey, data warehouse documentation and implementing a data lake as a data warehouse extension are similarly notable ways to increase data warehouse usage.

42 percent report improved self-service support. This is a major benefit, as this area was rated the second most important challenge to tackle. Furthermore, self-service capabilities can help address some pressing issues at least temporarily, such as poor adaptability of data models to new or changing requirements. It is interesting that of those who utilize machine learning for process automation, the highest benefit share was reached in this area.

In contrast, only 30 percent saw improved efficiency of data management processes in order to address the highest rated challenge of time-consuming development processes. Evaluation details indicate that microservices and containerization may

have potential in this area. 52 and 53 percent, respectively, of those who have applied these approaches have achieved such improvements. But so far, it seems the key to more efficient and effective data management processes remains elusive.

As with the challenges, respondents in different roles also have different perspectives here. Business users see improvements in support for BI and advanced analytics requirements (47 percent) and better suited data models for business requirements (45 percent). Executives agree on the data models (51 percent) and especially welcome the ability to handle a variety of data (52 percent) above improved self-service enablement (51 percent). Significant reduction in software costs, one of the major executive concerns, could not be achieved on a broad basis. Members of BI and analytics teams appreciate the broad use of the data warehouse (45 percent), but also value improved adaptability to new requirements (44 percent) above the improved support of self-service (43 percent).

Although time-consuming development processes was the highest rated challenge, benefits of more efficient data management processes were reported less frequently.

Lack of Agility and Skills as Well as Data Landscape Complexity Limit the Ability to Act

While there is no truly dominating challenge that companies faced in modernizing the data warehouse environment, it seems they did frequently encounter a lack of agility in infrastructure and internal processes (39 percent). Infrastructure inflexibility is a key factor for moving applications to cloud environments. However, on average only 29 percent of our participants are adopting cloud services for their data warehouse. In general, enterprises with more mature data warehouse environments are more geared towards moving into the cloud and report fewer infrastructure and process challenges. They clearly profit from their investments in a flexible data and process architecture and agile data services.

A striking challenge in modernization is the lack of agility in infrastructure and internal processes. This applies in particular to followers and laggards, whereas leaders appear to profit from their investments in cloud services.

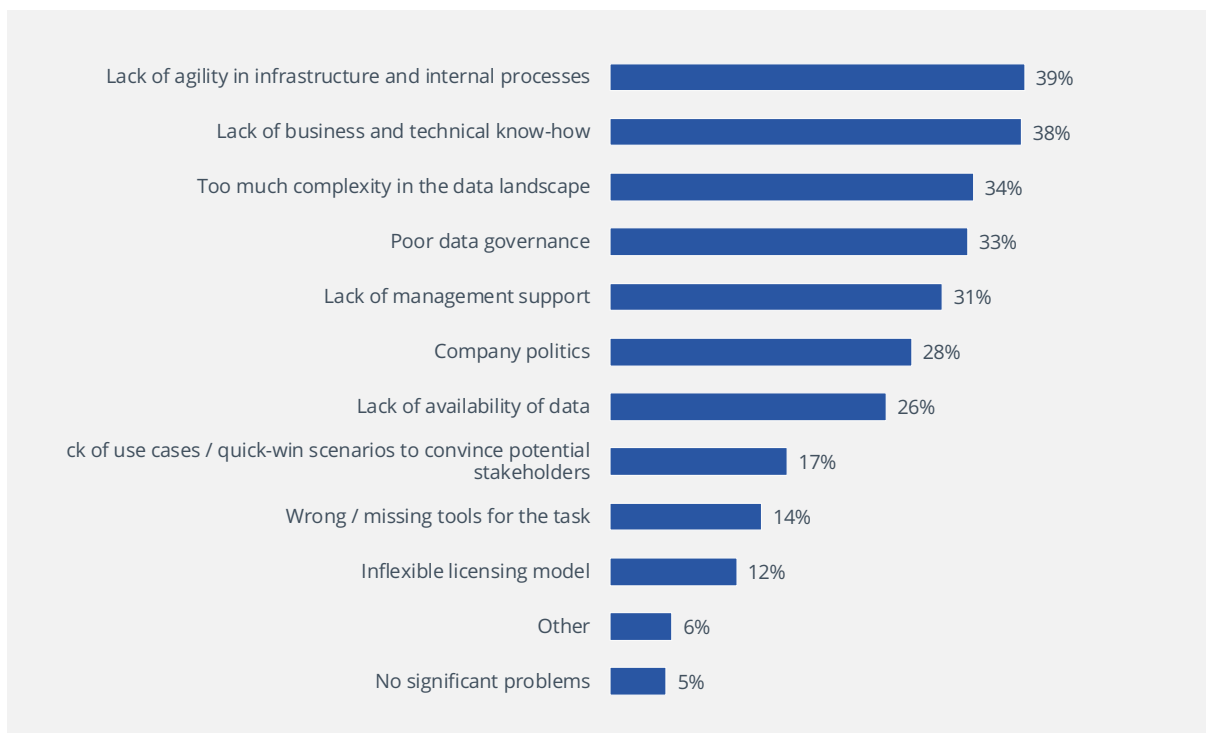


Figure 6: What are the biggest challenges your company faced in modernizing its data warehouse environment? (n=380)

Another major issue reported by participants is the lack of business and technical know-how (38 percent), which our studies have repeatedly encountered in recent years. Data and analytics literacy is not only an immensely important success factor for building an effective, cost-efficient and sustainable data warehouse environment. These skills are invaluable for the transformation to the digital enterprise, yet they are rare. Enterprises with less advanced data warehouse environments struggle more than those who are more advanced. However, it is vital to realize that this area requires investment in existing employees in any case.

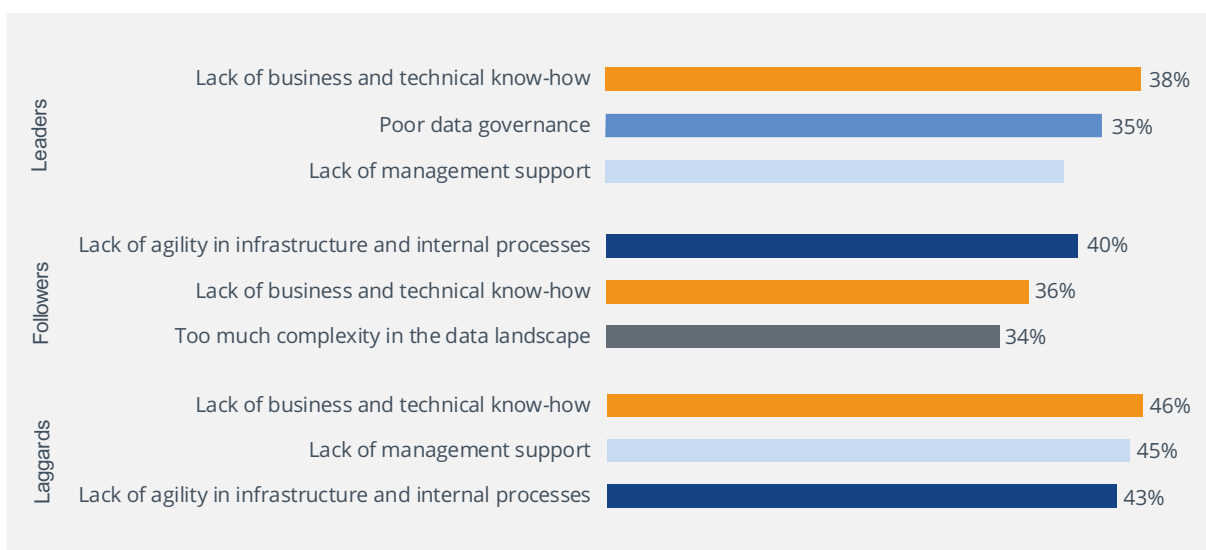


Figure 7: Top 3 modernization challenges faced based on environment maturity (n=373)

Too much complexity in the data landscape (34 percent) is probably one of the major reasons only 30 percent of our respondents have increased efficiency of data management processes, even though it is one of the most pressing issues. The problem here is that the data warehouse environment is only maintaining but not solving the shortcomings of the source data. It is a chicken-and-egg issue that can only be addressed with an overarching data strategy and governance program. Realizing this, 33 percent of participants identify poor data governance as a deficiency in modernizing the overall data and analytics environments. Companies with a more mature landscape appear to have already succeeded in reducing complexity (or had a less complex landscape to begin with). However, the appreciation for strong data governance is even higher with these companies than with less mature implementations (second place compared to fourth place for both followers and leaders).

At first glance, lack of management support appears to be a minor challenge for modernization initiatives, rated fifth by respondents overall. Closer inspection reveals, however, that laggards in particular suffer from a lack of executive support (44 percent). After lack of business and technical know-how (45 percent) this challenge is tied with insufficient agility (44 percent) at second highest. It is understandable that followers have fewer problems here with 27 percent. Building a central data warehouse requires appropriate management support. But surprisingly, advanced users are more likely to have the problem again (38 percent). Efforts in the data landscape must be holistic at this stage of maturity. Focusing only on the data warehouse only makes implementation more difficult.

In any case, technology is not a significant limiting factor. Only 14 percent report having wrong or missing tools for the task.

Complexity in the data landscape and poor data governance at the same time prevent companies from making their data management processes more efficient. However, the implementation of a holistic and agile data architecture requires in particular management support.

Leaders Target Agile and Interoperable Data Services Based on a Flexible Data and Process Architecture

We asked participants to describe their current data warehouse and analytics environment so we could analyze any correlations between environment maturity and modernization challenges, measures and benefits achieved. Maturity level definitions were taken from the Business Intelligence Maturity Model (biMM®), which was used in the biMA study most recently conducted 2017/18 by Sopra Steria with the support of BARC. The relevant perspective on technology and architecture for data and analytics is defined in figure 8:

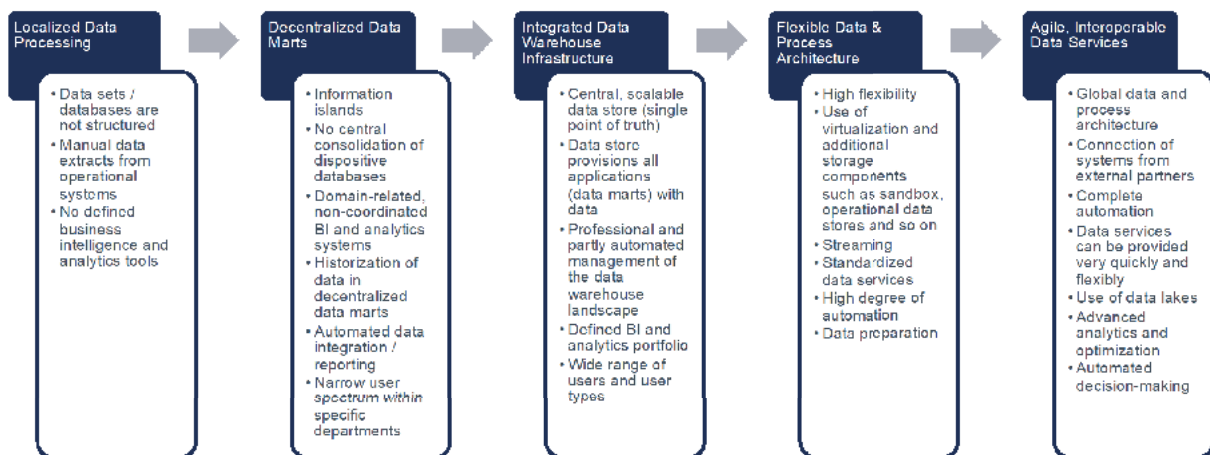


Figure 8: Technology & architecture perspective of the Business Intelligence Maturity Model (biMM®)

The self-assessment results show a clear dominance of "Integrated Data Warehouse Infrastructure," which corresponds to the average rating outcome of the biMA study in 2017/2018.

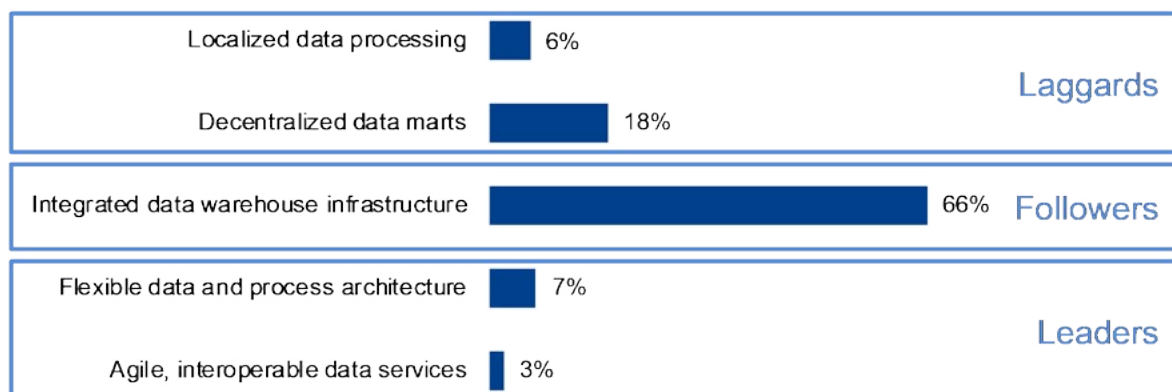


Figure 9: What is the best way to describe your data warehouse and analytics environment? (n=389)

A majority of survey participants is focused on the concept of a “single point of truth” manifested in a central data warehouse, making this environment available to the most users possible. Lower level environments concentrate on identifying and systematizing decentralized data and business intelligence initiatives, but without tackling consolidation. Higher level types build on an already-ordered environment. They use the knowledge gained to utilize data and analytics beyond the data warehouse. Agile prototyping for advanced analyses is promoted. Analytics and data-driven processes become integral to operational business processes.

Given the variation in development, it is understandable that organizations choose different approaches to modernize the data warehouse and analytics environment. While data warehouse/ ETL automation leads the list for all maturity levels (see Figure 10), other preferred approaches vary.

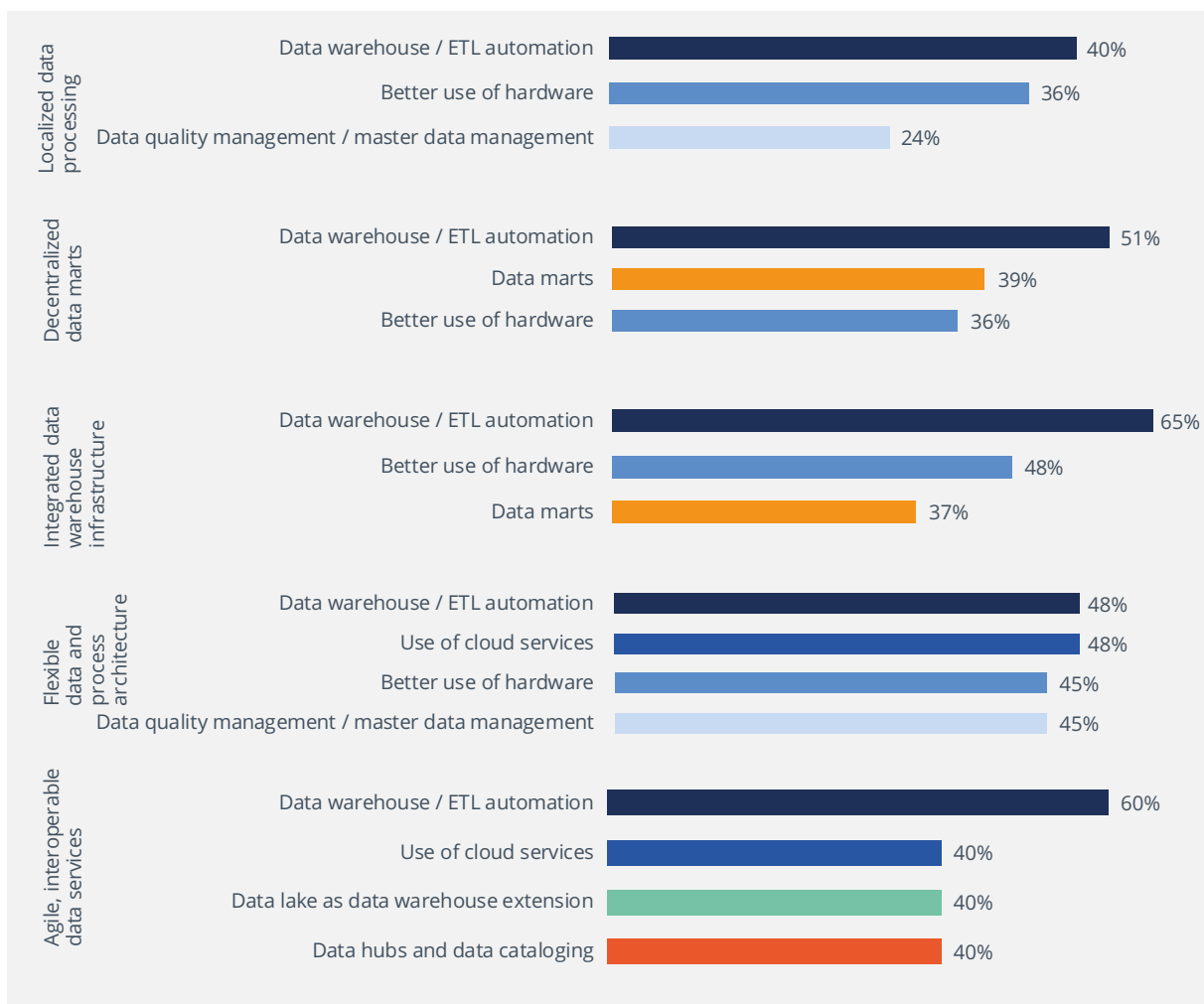


Figure 10: The three most frequently chosen modernization approaches by maturity level (n=385)

Better utilization of hardware is a general goal. However, more mature data warehouse implementations tend to use cloud services much more. Data quality and master data management is obviously popular among respondents with localized data processing. The journey to a „single point of truth,“ manifested in an integrated data warehouse infrastructure, should make quality-checked, standardized data available in one place. But the transition to agile and interoperable data services based on a flexible data and process architecture requires this high-quality data to also be available outside of the data warehouse. Therefore, data quality and master data management suddenly again become an important approach for maturity level 4.

Enterprises focused on agile, interoperable data services frequently choose to implement a data lake as an extension to the data warehouse. In the context of extended analytical requirements, additional data sources must be supported that have not (yet) found a home in the data warehouse. Data hubs and data catalogs may also be deployed. Data hubs support the provision of data services, while data catalogs help users find data or analyses and collaborate with other users.

Data quality and master data management can be addressed by the data warehouse for some requirements. The data-driven company, however, also needs high-quality data beyond this „single point of truth“.

Pioneering Data and Analytics with New Approaches

Participants were asked to evaluate selected data management trends as very important, important, less important or not important at all. Figure 11 shows the ratings in groups for readability: very important and important, and less important and unimportant.

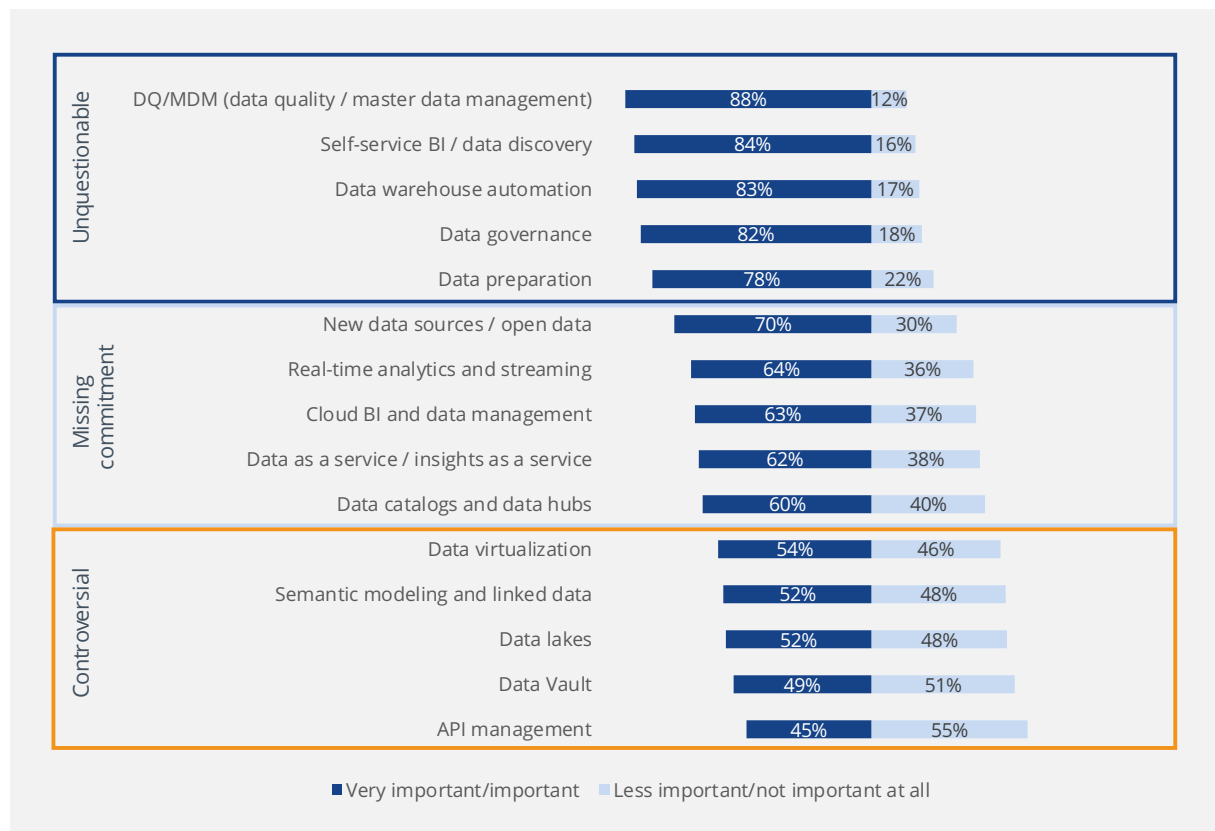


Figure 11: How important do you consider the following data management trends? (n=492)

The trends fall easily into three groups, with clear agreement about the five most important trends. Rankings also agree with the survey findings with regard to challenges and solutions. The target for the next few years is thus clearly defined. Data warehouse development is to be streamlined through data warehouse automation. At the same time, DQM and MDM as well as data governance should improve company data. Ultimately, self-service BI and data preparation will provide flexible and more agile provisioning information for decision making and perhaps even decision automation .

The growing importance of the five trends in the middle is quite clear, but evidence of clear commitment among participants is absent from this study. Only the leaders are moving in the direction of these trends. Remarkably, new data sources/open data was even identified by the leaders as the most important

The most important trends are undisputed and aim at a more efficient, effective and agile handling of data through data governance, automation and self-service.

trend of all (47 percent for very important). For them, the importance of the cloud is also undisputed. It ranks second together with self-service BI / data discovery (both 42 percent for very important).

The five trends in the lowest group must be regarded as controversial. But here, too, there are differences in the assessment of the „very important“ trends. Data virtualization is a top trend according to leaders (38 percent compared to 13 percent for followers and 15 percent for laggards). Leaders see Data Vault as the least important trend (6 percent compared to 9 percent for followers and 11 percent for laggards).

Leaders show a clearer commitment to innovative trends such as new data sources/open data, cloud BI and data management, and data virtualization.

Appendix A: Methodology and Demographics

The online survey was conducted worldwide from January to May 2019. BARC promoted the survey through websites, in email newsletters and directly to the BARC research panel. A total of 368 people from a wide range of competencies (see figure 12), industries (see figure 14) and company sizes (see figure 15) participated in this survey. The positions of participants (see figure 12) were bundled into groups to aid evaluability. In our analysis we refer to the following groups: BI and analytics teams, line of business, executives, IT and external consultants. Most participants came from Europe (77 percent), while 16 percent were from North America. Asia Pacific (4 percent) and South America (2 percent) were represented by a smaller number of participants (see figure 13). Deviations are possible due to the rounding of figures.

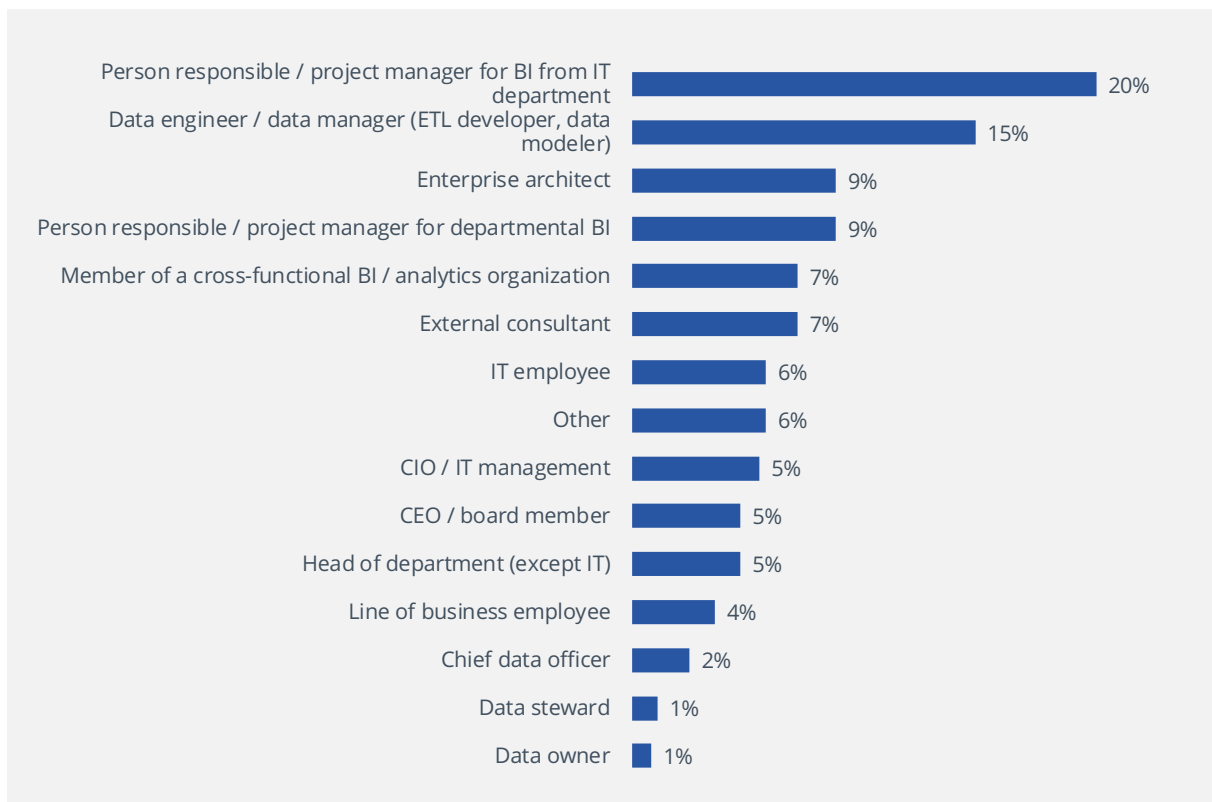


Figure 12 Which position do you hold within the company? (n=368)

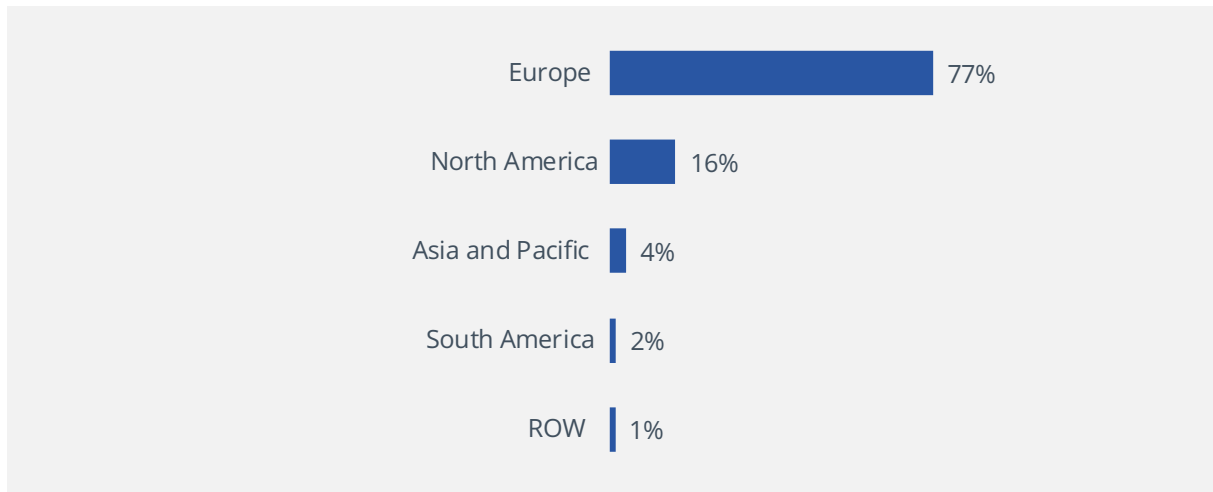


Figure 13 In which country are you located? (n=368)

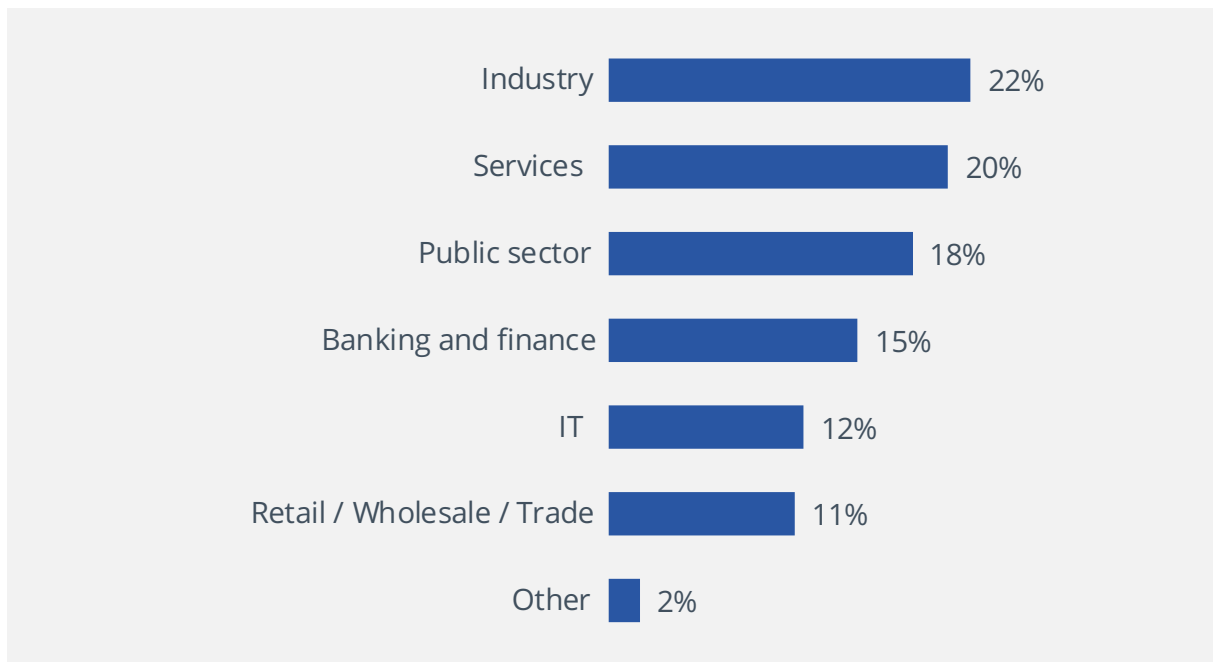


Figure 14 Which of the following best describes your industry sector? (n=368)

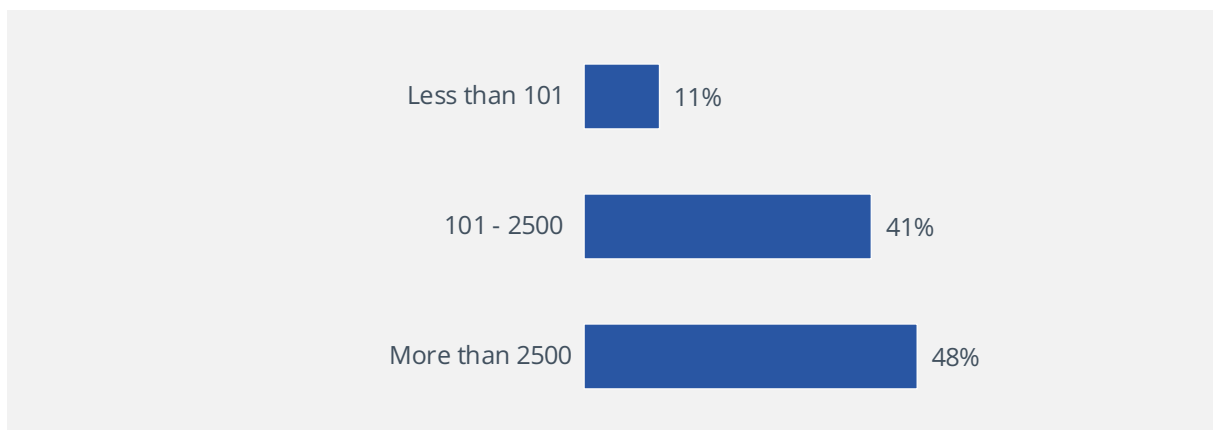


Figure 15 How many employees does your company have (including all departments, branches and subsidiaries)? (n=368)

BARC – Business Application Research Center



BARC is a leading enterprise software industry analyst and consulting firm delivering information to more than 1,000 customers each year.

For over twenty years, BARC analysts have combined market, product and implementation expertise to advise companies and evaluate BI, Data Management, ECM, CRM and ERP products. A long-running program of market analysis and product comparison studies forms the basis of BARC's comprehensive knowledge of all the leading software vendors and products, as well as the latest market developments and trends.

BARC events provide a focused overview of leading software solutions, trendsetting developments and current requirements, as well as market developments in particular enterprise application categories.

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WhereScape Data Automation software accelerates the design, build, documentation and management of complex data ecosystems. WhereScape sits on top of and orchestrates your existing data infrastructure using automated ELT. Data Automation enables developers to produce data architectures in a fraction of the time it would take with hand coding, without human error. It enables individual staff members to be more productive and innovative by eliminating repetitive manual tasks.

WhereScape 3D® models, designs and prototypes data architectures with automation to fast-track delivery while reducing cost and risk. This allows IT to quickly spin up models for verification with the business before they build, resulting in close collaboration and shorter iterations.

WhereScape RED® builds, documents and manages data architectures via a drag-and-drop GUI. It commits changes to the underlying database by automatically generating thousands of lines of SQL code in seconds, enabling one developer to do the job of ten. Project builds and changes are managed by developers but committed with automation in a fraction of the time versus hand coding. The result is data warehouses that just work, fuelling data-driven business decisions.

WhereScape Data Vault Express® makes Data Vault 2.0 implementations quicker and safer whilst shortening the learning curve for data teams. Automation is simply essential for Data Vault projects given the complexity involved in building and maintenance. It uses tried-and-tested templates that follow industry best practices to ensure implementations are successful, while automation manages intricate dependencies that build up over time.

WhereScape Automation with Streaming® enables you to continuously ingest data from IoT sensor data, log files, online retail purchases, social media content and other Big Data. This gives visibility into trends, trouble spots and opportunities as they emerge in real-time. Automation enables data teams to safely incorporate these new data sources into existing analytic environments and make them accessible to the business faster.

WhereScape Migration Express® uses metadata to lift and shift data and data infrastructure from one database to another as your business needs evolve. This means you are not locked in and can be moved to a different on-premises or cloud database at any time. The tool uses templates to drastically reduce the time and man-power needed to migrate databases manually, and is particularly suited to the growing number of companies switching some or all of their infrastructure onto Snowflake's elastic cloud.

WhereScape® Data Automation

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