Solution Path for Building Modern Analytics and BI Architectures

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Initiatives: Analytics and Artificial Intelligence for Technical Professionals; Data Management Solutions for Technical Professionals; Evolve Technology and Process Capabilities to Support D&A

Traditional analytic architectures must evolve to become more agile, sophisticated and accessible to the business user. This research provides data and analytics technical professionals with a roadmap to build self-service analytics and business intelligence architectures.

Overview

Key Findings

- Organizations are struggling to balance the requirement to deliver faster and more agile analytics, with the necessity to control the use of data and reduce risks.
- Establishing a hands-off approach to self-service analytics and business intelligence (A&BI) results in challenges with siloed analytics, data duplication and inconsistent findings across reports. This undermines self-service initiatives, leading to a lack of trust in the data.
- Building a modern A&BI stack necessitates close collaboration between D&A, the business and other IT stakeholders to establish requirements and devise a roadmap to implement data infrastructure and analytics tooling that enables the business to realize its analytics goals.

Recommendations

Data and analytics (D&A) technical professionals attempting to build a modern A&BI architecture should:

- Translate the organization's analytics mission into technical capabilities by collaborating with the business to define analytical personas and requirements through identifying use cases, obstacles and opportunities.
- Overcome resistance to change by capturing metrics of success that demonstrate value and progress toward meeting the organization's analytical goals.
- Create consistency and establish trust in analytics by delivering high-quality data for self-service through a business-friendly data layer, defining metrics and training users in D&A best practices.
- Build a modern analytics architecture that includes advanced and augmented capabilities. Seek out opportunities to increase velocity and agility while imposing more governance where needed.

Problem Statement

"How do I implement a modern analytics and business intelligence architecture that focuses on the business user and balances agility and control?"

Solution Path Diagram

Historically, enterprise reporting and other business intelligence (BI) activities were the responsibility of IT or a centralized data and analytics (D&A) team within organizations. But today, business units' requirements for analytics have gone far beyond IT's capabilities to satisfy. Analytics outputs are moving from descriptive and diagnostic reports and dashboards to predictive and prescriptive through AI-enabled capabilities and interfaces. Business logic and semantic models are moving from being embedded within analytics and BI (A&BI) tools to more reusable, federated data management architectures. Analytics is now occurring earlier in the data pipeline and is being embedded in streams, edge devices and data management platforms.

The focus on becoming "data driven" is pushing businesses to adopt self-service analytics frameworks, empowering business analysts to access data and leverage it for insight. This mode of business analytics increases the speed and proliferation of data and analytics consumption. However, organizations that have nurtured self-service analytics solely via technology investments must change because they do not resolve long-standing people and process limitations that stop analytics initiatives from succeeding. Instead, they must begin with strategy, mission, metrics, training, governance and processes. As a result, D&A technical professionals are being asked to modernize traditional, outdated analytics strategies.

This Solution Path provides a roadmap for building a modern A&BI capability that enables the business to achieve its analytics goals while balancing control and agility. It does so by supporting the business across the following key pillars: data capabilities, analytics capabilities, roles and skills, and process and governance.

The steps in this Solution Path are as follows:

- Step 1: Plan
  - Assess Current State
  - Define Future State
  - Develop Strategy and Roadmap
- Step 2: Design
  - Rationalize Existing Analytics Tooling
  - Evaluate and Select A&BI Tooling
  - Design D&A Architecture
- Step 3: Deploy
  - Implement Data Architecture
  - Deploy A&BI Tooling
  - Deliver Specialized Analytics Capabilities
- Step 4: Operationalize
  - Create Analytics COE/CoP
  - Evolve to Predictive and Prescriptive
  - Repeat Steps 1-4 Regularly

- Repeat at Each Step:
  - Mitigate Resistance Using Change Management
  - Derive and Implement D&A Governance Framework
  - Develop Skills by Delivering Specialized Training

These steps are illustrated in Figure 1.

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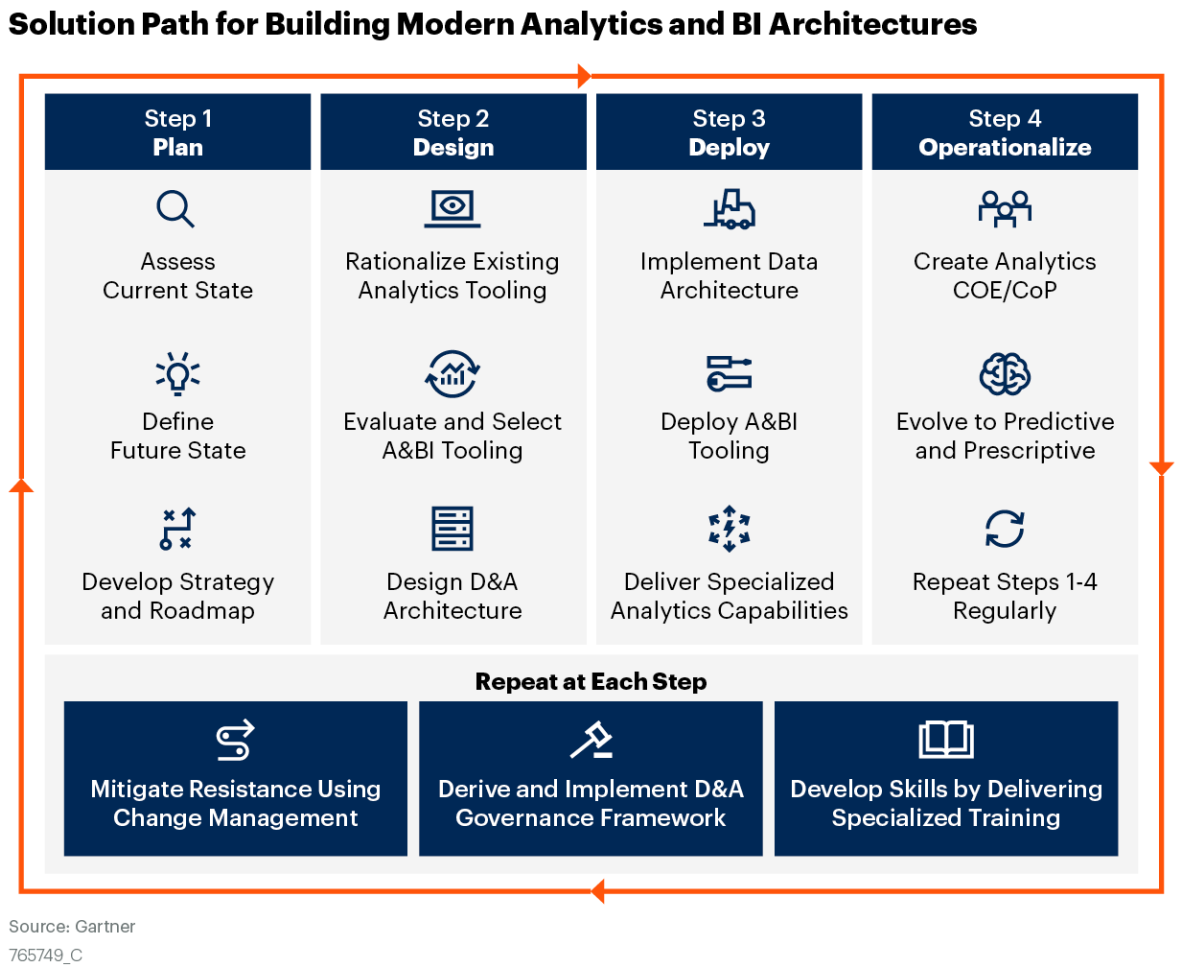
Figure 1: Solution Path for Building Modern Analytics and BI Architectures



Source: Gartner
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Solution Path

Step 1: Plan

1.1 Assess Current State

The first step in developing a strategy for analytics modernization is to assess the current state of analytics within the organization. D&A technical professionals should collaborate with the business and other IT stakeholders to examine factors such as:

- Existing data and analytics tools and technologies
- Use cases and presentation groupings
- Latency and performance of analytical assets and supporting data infrastructure
- Timelines, outputs and success of any past or present data strategy within the organization
- Analytics business value generation
- Reliability of key metrics and measures
- Business perception of the value of data and analytics
- Data literacy across the organization
- Time and procedure for implementing an analytics dashboard or report — from ideation to productionization

Less mature A&BI programs are likely to experience obstacles such as:

- A central IT team that handles analytics content authoring and data model preparation that has become a bottleneck and prolongs insight delivery.
- A cumbersome, legacy IT infrastructure that is inaccessible and inflexible for a non-IT professional that prohibits self-service analytics.
- Little or poor communication between IT and business users, leading to a misalignment between expectations and reality.
- A&BI functionality based mainly on reports with spreadsheets, canned reports, ad hoc queries and some dashboards.

- Poor data literacy and a lack of understanding of the value of data and analytics, which contributes to a resistance to changing existing analytics processes.
- Inconsistent and confusing data access policies and procedures that frustrate end users and discourage exploration and innovation.

Whereas, in more mature organizations, inhibitors of D&A success can include:

- An excessive focus on technology investments, with less support for the organizational, process and skills requirements for successful D&A initiatives.
- A complex analytics architecture, including multiple analytics tools with overlapping capabilities and data spread across multiple cloud data warehouses.
- Many complex processes and procedures surrounding access to and use of data and analytics resources, resulting in a rigid, inflexible system that limits innovation.

It is not enough to just discover that these problems exist. Technical professionals should evaluate how impactful these obstacles are on their goals, and what the cost/effort would be to overcome them. This information will be extremely useful when defining priorities and metrics to measure success. This, in turn, informs the overall strategy for delivering a modern, A&BI architecture. For additional advice on this, refer to the Mitigate Resistance Using Change Management and Develop Skills by Delivering Specialized Training sections of this document.

1.2 Define Future State

After assessing the existing analytics capability, the next step is to determine analytics goals:

1. Establish the analytics mission and vision in order to have guiding principles to inform the rest of your actions.
2. Explore potential analytics use cases that are currently not being addressed.
3. Create metrics that align with your strategy in order to prioritize the most effective analytics investments.

Gartner's annual Chief Data Officer (CDO) survey consistently finds that a lack of business stakeholder involvement and support is a top inhibitor of D&A success. [1] As analytics evolves from a support function to a critical driver of value, organizations must develop a mission and vision for analytics and promote this throughout the enterprise. This helps to engage the business and change stakeholder mindsets and behavior around data.

Ideally, this mission and vision has been created by D&A leadership. However, in many organizations, D&A initiatives have jumped straight into technology without revisiting this valuable step of aligning with the mission. Technical professionals will need to partner with their D&A leaders to develop the mission statement for D&A. The mission statement for D&A should be linked to the corporate mission statement and be relevant, specific and inspirational. For example, the mission statement for D&A could have the following structure:

> **To support [insert overarching corporate goal], we [insert phrases about D&A's nature as utility, enabler or driver] by [insert "next level" achievement in terms of stakeholder value].**
>
> — *Gartner 2022*

Next, D&A leadership should look to build a portfolio of different analytics use cases and business outcomes, each providing specific measurable business benefits. These business goals function best when they are directly linked to the organization's strategy and are another layer that helps realize the vision of connecting analytics with business impact.

Performance measurement is critical to the execution of analytics modernization because it helps to demonstrate progress and results. The most common goals in data and analytics strategies are:

- Supporting better decisions
- Providing the right information at the right time to the right people
- Reaching a single version of truth
- Creating better alignment with cross-functional peers and stakeholders

- Fixing data quality
- Improving agility
- Simplifying analytics architecture
- Increasing accessibility and ease of use of data

Acquiring new technology will not by itself achieve any of the goals listed above. Only when the technology enables specific business outcomes will analytics maturity improve and the organization start to see progress toward these goals. Therefore, the measurement of analytics performance needs to be tightly aligned with business problems or specific business outcomes.

Metrics to measure success should be focused on technical improvement, business process improvement and business outcomes. Good metrics are specific and quantifiable. They also address different processes in the organization. They are meant to drive change, behavior or outcomes. Metrics should be validated with the appropriate stakeholders — individuals with the subject matter expertise to be able to provide feedback on the metrics selected. Metrics measured at baseline and throughout the implementation of the data strategy will track progress and testify to the success of the initiative. Demonstrating value through improvement in key metrics will keep stakeholders engaged and can also be used as justification in future requests for funding.

1.3 Develop Strategy and Roadmap

Analytics initiatives often struggle to deliver the expected business impact. Data and analytics technical professionals tend to recognize this problem, but still have difficulties developing a strategy and setting an evolution roadmap for their analytics architecture that can support and be linked to the achievement of business outcomes.

A major reason why there is a gap between users' expectations and the reality of data and analytics deployments is the excessive focus on technologies, tools and vendors, with insufficient commitment to the benefits and value that implementations actually bring. Additionally, these D&A initiatives are often poorly prioritized, leading to nonessential D&A projects that are less crucial to the organization's objectives occupying a much larger share of D&A technical professional energy and resources to support than they should.

Analytics projects often start with a vague business request, are highly focused on the implementation of D&A capabilities and are considered successful when delivered to users. But this is all without any guarantee that the expected business outcomes will be achieved. To increase the impact of analytics on the organization, D&A technical professionals need to change their mindset and shift the focus beyond the implementation of analytics capabilities to the delivery of business outcomes.

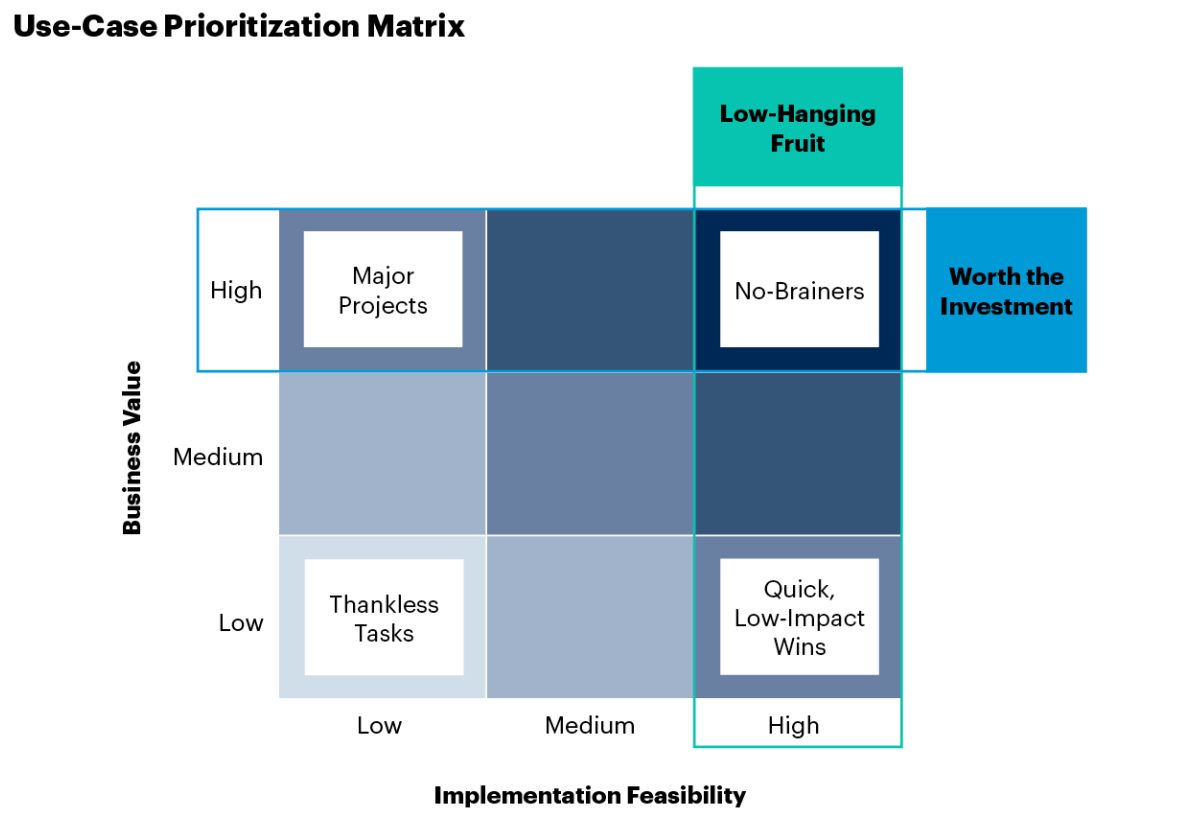
Gartner has observed that effective data strategies exhibit the following traits:

- They are concrete, actionable and specific.
- They include metrics from the outset.
- They use roadmaps for short-, medium- and long-term scales.
- They implement foundational technologies by use case.
- They coordinate business use cases, governance use cases and delivered solutions.
- They coordinate people, process, policy and technology.

On first use, technical professionals should work with their leaders on a short-term roadmap of up to 12 months. This will allow enough time to apply best practices and react to any changes in business or technology. The roadmap enables executive teams and stakeholders to evaluate the pace, direction and milestones of the analytics initiative. When deciding the order and priority of projects, data and analytics technical professionals should look at the use cases identified by the business in the previous step and take into consideration their potential benefits and requirements.

It is easier to begin a project with a single requirement within one line of business (LOB) that has simple or well-defined business processes (such as automating sales forecast tasks done manually in spreadsheets). Do not start with the organization's biggest pain point unless it can be solved through better analysis alone, which it normally cannot. The relationship between feasibility (i.e., effort, complexity and difficulty) and business value is illustrated in Figure 2.

Figure 2: Use-Case Prioritization Matrix



Source: Gartner
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This effort should also coordinate with the overall data and analytics strategy, discussed in Creating a Data Strategy, as well as Solution Path for Building a Holistic Data Management and Analytics Architecture.

Before Proceeding to Step 2

At this point, the technical professional should have achieved the following:

- Performed a gap analysis that identifies the discrepancy between the current state of A&BI in the organization and the desired future state.
- Gathered a set of business use cases for analytics and identified a project to start with.
- Created a mission and vision statement and defined metrics to measure success.

- Developed a strategy and roadmap for implementing or evolving a modern A&BI capacity for the organization.

Recommended Reading for Step 1

For more information on creating a holistic D&A strategy, see the following documents:

- Solution Path for Building a Holistic Data Management and Analytics Architecture
- Creating a Data Strategy

For more information on discovering analytics use cases, and how they link to the evolution of analytics platforms, see:

- Solution Path for Building an Effective Technical AI Strategy
- Evolving Capabilities of Analytics and Business Intelligence Platforms

Step 2: Design

2.1 Rationalize Existing Analytics Tooling

Having identified critical use cases and gaps in existing analytics capabilities as part of the planning phase, the temptation may be to launch straight into evaluating new prospective A&BI tools. However, introducing a new platform into the analytics ecosystem without rationalizing the existing toolset can lead to duplicate or overlapping functionality. Many organizations already have more than one A&BI platform and may also have an enterprise reporting tool and other specialized or domain-specific analytics tools. This can be the result of mergers and acquisitions or just simply a prior, decentralized approach to analytics, where individual business units were empowered to make their own purchasing decisions. A growing number of such tools within the organization places a huge burden on IT to support and maintain the tools and govern analytics.

Instead, D&A technical professionals must conduct a rationalization and consolidation exercise of existing tools to highlight the true gaps in capabilities and identify opportunities to simplify their analytics ecosystem by consolidating or retiring certain tools. This is a difficult decision to make and should not be made lightly. There is no clear path for migrating from one A&BI tool to another. The move takes considerable time and effort because datasets and reports must be recreated from scratch.

Particular attention must be paid to how the capabilities of existing tools align to analytics use cases within the business. Without this, there is a risk that retiring certain tools can introduce capability gaps. For example, many organizations migrate from legacy enterprise reporting tools to a modern A&BI platform with a view to supporting self-service analytics use cases. These organizations often find that the lack of pivot table and paginated/pixel-perfect reporting capabilities of modern A&BI platforms disappoints many of their users. In addition to technical capabilities, details about user affinity, number of active users, projected usage trajectory and number of analytics artifacts should all be factored into the decision.

The analytics tool audit should be led by IT but carried out jointly with business units in order to build a comprehensive view of the tools throughout the organization. It is necessary to evaluate not only the stand-alone software and platforms being used for their analytics functionality, but also the many analytics functions of business applications.

Completing this assessment can highlight issues and should provide enough input for initial discussions with internal stakeholders about the likely next steps toward rationalization. The aim should be to consolidate tooling and simplify the analytics landscape as much as possible to reduce costs and management overheads. However, in some cases, the organization may choose to keep more than one A&BI tool to avoid disruption or to leverage discrete capabilities to meet the varying demands of the business.

2.2 Evaluate and Select A&BI Tooling

Following tool rationalization, D&A technical professionals should have a clear picture of the tools they will maintain, their capabilities and the use cases these are aligned to. Similarly, for tools to be retired, there must be a strong strategy for migrating essential content from the retired tool to another platform. Datasets, reports, dashboards, and so on, cannot be lifted-and-shifted from one platform to another. In the vast majority of cases, they must be recreated from scratch in the new platform. Due to the time and effort of migration, only content that provides ongoing value to the business should be migrated.

In some cases, the organization may consolidate onto a tool already deployed within the business. This works when the organization has more than one modern A&BI platform with overlapping capabilities. The strategy may be to standardize on the A&BI platform with the most comprehensive feature set, or the platform with the greatest adoption, affinity and number of existing analytical assets. Alternatively, the business may choose to standardize on the A&BI platform that best aligns with their existing infrastructure or cloud commitments and sits closest to the data.

However, it is also possible that the organization may choose to acquire a new A&BI platform and standardize on this. By conducting a detailed requirements gathering exercise with the business and rationalizing the existing toolset, D&A technical professionals should get a clear picture of the gaps in existing analytical capabilities. For example, the organization may not already have a modern A&BI platform, or it may have one or more A&BI tools that do not satisfy the requirements of the business. Alternatively, concurrent changes in data infrastructure, such as the migration of on-premises data sources to the cloud, can necessitate a SaaS-based A&BI platform to support the new data landscape.

When selecting a new A&BI platform for the organization, D&A technical professionals should do a deep dive into the technical capabilities of their shortlisted tools to identify strengths and weakness. Gartner clients can use our published set of detailed Solution Criteria for Analytics and Business Intelligence Platforms to score and compare prospective vendors across a variety of technical capabilities. In addition to this tool, which must be downloaded and completed by a D&A technical professional, Gartner evaluated three leading vendors in this space and made the analysis available in Solution Comparison for SaaS Analytics and Business Intelligence Platforms. This research contains a comparison between the SaaS offerings of Microsoft (Power BI), Qlik (Qlik Sense Enterprise SaaS) and Salesforce (Tableau Cloud), the results of which are replicated in Figure 3. In addition to technical capabilities, D&A technical professionals must also consider their current and future D&A landscape, budget, data strategy, company policies and regulations.

Figure 3: Solution Comparison for SaaS Analytics and Business Intelligence Platforms

Solution Comparison for SaaS Analytics and Business Intelligence Platforms

Scoring	Power BI	Qlik Sense	Tableau
Core Criteria[a]	89	93	85
Competitive Criteria[b]	71	61	67
Competitive Criteria by Category			
Acquire	100	67	89
Organize	61	89	83
Analyze	86	59	52
Deliver	86	50	100
Govern	32	50	32

Low	Fair	Good	Very Good	Excellent
0-20	21-40	41-60	61-80	81-100

[a] Percent of core criteria met out of 27

[b] Competitive criteria carry weights according to their importance or value and competitive score is displayed as a percentage of the total overall and for the separate categories

Source: Gartner (April 2022)

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2.3 Design D&A Architecture

To support A&BI, D&A technical professionals must plan for how data will be delivered to the right users, in the right format. The data infrastructure to support A&BI should combine the following principles:

- **Outcome-oriented:** Aligns to the broader organization's goals.
- **Valuable:** Provides a benefit to users (e.g., accessible to a larger population of users, more flexible, supports more sophisticated analytics, more affordable).
- **Easy to learn:** Intuitive to grasp, with training resources available.
- **Available/reusable:** Easily accessed, embedded in applications and workflows, and reusable by multiple systems and users.
- **Safe:** Governance guardrails; sophisticated identity, access and security management.

- **SLA- and cost-optimized:** High-quality data delivered by a performant, reliable platform, at the best possible cost.
- **High-quality:** Delivers data that meets the organization's requirements for accuracy, completeness, relevance and timeliness.

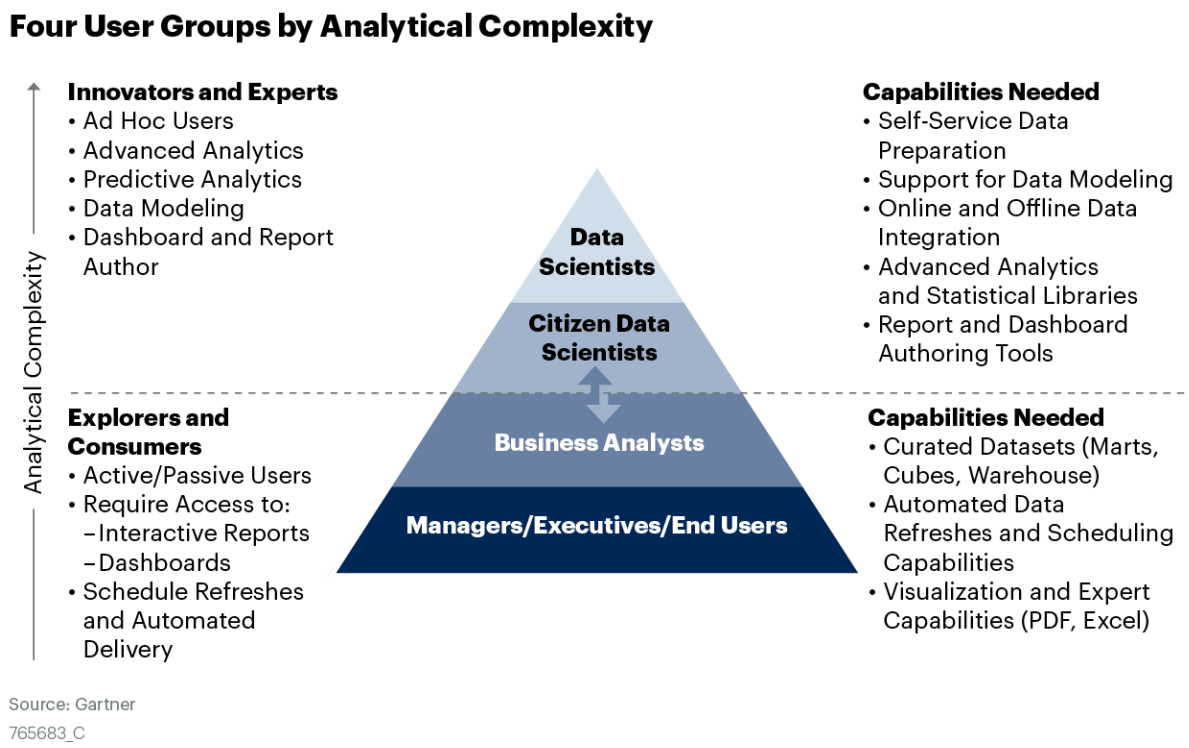
Some of these principles can often be opposing, creating challenges for D&A technical professionals. For example, it can be difficult to balance principles that align to agility (easy to learn, available) with those that align to control (safe, SLA- and cost-optimized) in order to deliver valuable outcomes to a diverse set of users.

Gartner recommends a federated architecture to support A&BI. This is founded on a blend of top-down and bottom-up approaches. This is described in detail in Reference Architecture to Enable Self-Service Analytics. In brief, the federated approach must provide:

- Standardized scalable architecture
- Support for an extensible physical and logical data model
- The centralized data repository, with dedicated partitions and zones for individual lines of business (LOBs)
- Consistent data definitions
- Agility to deliver multiple end-user analytics products and services
- A stronger partnership between IT and business
- Most importantly, the ability to truly support a self-service governed analytics platform

Data requirements vary by analytics use case within the business. A mapping of analytical personas to their corresponding data and analytics requirements is illustrated in Figure 4.

Figure 4: User Group by Analytical Complexity



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The first step in designing a federated architecture to support A&BI is to assess existing infrastructure investments. In most cases, D&A is not a greenfield or unilateral solution but a brownfield one. It consists of multiple layers of technologies that need to work and operate independently, and often in concert with one another. If the organization has existing on-premises and cloud investments, such as data warehouses, data virtualization tools or semantic layer tools, D&A technical professionals must initially determine whether they can be extended or modified to support analytics use cases.

Next, D&A technical professionals responsible for delivering modern A&BI capabilities for the business should align their design to any overarching data strategy within the organization. This data strategy may be owned by a solution architect or similar role within IT. If, for example, part of the data strategy requires migrating on-premises data assets to the cloud, the D&A technical professional should avoid creating further on-premises assets that would only need to be migrated at a later date. Instead, they can collaborate with D&A technical professionals responsible for migration to the cloud to determine their options.

Before Proceeding to Step 3

At this point, the D&A technical professional should have achieved the following:

- Composed a list of technical capabilities that align to analytics use cases, including enterprise reporting and self-service A&BI use cases.
- Identified a tool, or set of tools, to support A&BI use cases. This includes rationalizing the existing toolset to determine which tools to maintain or retire and whether there are sufficient capability gaps to justify acquiring a new analytics tool.
- Plans to introduce any new A&BI tools, which should be identified and have proof of concepts (POCs) completed.
- A design for a data architecture that will support the chosen tooling and known analytics use cases.

Recommended Reading for Step 2

For more information on selecting A&BI tooling, see the following documents:

- Evolving Capabilities of Analytics and Business Intelligence Platforms
- Solution Criteria for Analytics and Business Intelligence Platforms
- Solution Comparison for SaaS Analytics and Business Intelligence Platforms
- Communicate Insights Effectively With Augmented Data Visualization and Storytelling

For more information on creating D&A architecture to support analytics, see the following documents:

- Solution Path for Building a Holistic Data Management and Analytics Architecture
- Comparison of Data Stores to Support Modern Use Cases
- Reference Architecture to Enable Self-Service Analytics
- Demystifying Semantic Layers for Self-Service Analytics
- Identifying Data Access Patterns for Multicloud and Intercloud
- Exploring Lakehouse Architecture and Use Cases

- Assessing the Relevance of Data Virtualization in Modern Data Architectures

Step 3: Deploy

3.1 Implement Data Architecture

The primary goal of implementing a modern A&BI capability is to empower its users to derive faster insights from the data. Through numerous surveys, Gartner has learned that the biggest bottleneck for any analytics project is the data preparation phase. It takes more than 65% of the overall project time to deliver data in a consumable format.

To combat this, architect and deploy a centralized data repository to unify — physically or virtually — data needed for analytics. This can reduce data movement across multiple data stores and analytical systems, help identify new relationships between data elements, and enable more effective governance and control over the data. It is a core architectural component of a federated A&BI solution. Having a single location to fetch high-quality data for standardized operational reporting and self-service A&BI leads to greater consistency and trust in data and analytics content. The key to achieving a successful federated data architecture for A&BI is to have a clear understanding of analytics use cases. This ensures that D&A technical professionals create fit-for-purpose datasets in the right format that supports a wide range of use cases.

The burden on IT for building and maintaining data for A&BI will vary depending on the implementation method. IT can create, own and manage curated data for A&BI by building things like materialized views (MVs) within data warehouses, built-for-purpose data marts (such as an SSDM), or a semantic layer within the A&BI tool itself. The former is a precomputed result set, stored in memory, that is based on an SQL query over one or more base tables. MVs provide an element of consistency across analytics content by prejoining data from multiple base tables and reducing the results subset using various filters and aggregations. In addition, MVs are useful for speeding up queries that are predictable and repeated, queries on large tables, and complex queries that are compute-resource-intensive. An SSDM goes one step further than an MV, allowing D&A technical professionals to combine data across multiple different source systems within the organization. As such, SSDMs also help to simplify security protocols like row-level security (RLS), object-level security (OLS) and identity access management (IAM). A semantic layer embedded within an A&BI platform is essentially a collection of curated datasets housed within the platform and shared across multiple reports.

These approaches allow IT or a central D&A capacity to maintain a high degree of control over the data, establishing governance and promoting consistency of metrics across analytics content. However, they do place a greater burden on IT to create and maintain them. IT must collaborate closely with the business to ensure the data meets their expectations and delivers on their specific use cases. This is an ongoing effort, as new use cases need to be accommodated over time.

Alternatively, IT can allow business users to conduct their own self-service data preparation to shift at least some of this responsibility to the business. This has the benefit of democratizing dataset ownership and increasing the agility of dataset development. Self-service users can utilize data wrangling capabilities within the chosen A&BI tool or even specialized tools for this purpose. Self-service data preparation tools are designed to simplify the process and guide users through combining, cleaning and curating datasets through a drag-and-drop interface. This negates the need for SQL or other coding languages. Although this does provide a great degree of flexibility for the self-service user, it frequently leads to issues like siloed analytics, duplicated datasets and inconsistencies in metrics and KPIs across reports, which can undermine the business's trust in analytics. As a rule, the closer the self-service data preparation occurs to the raw data, the greater the opportunity for these issues to arise.

Therefore, D&A technical professionals should think carefully about which self-service users are supported in preparing their own datasets and which are encouraged to leverage data curated by IT using one of the methods discussed above. Self-service data preparation should be limited to more experienced users and supported by best practices and governance processes instilled by IT. For example, this may involve a process for conducting a performance and security review before pushing a dataset from a development environment into production.

Alternatively, D&A technical professionals may choose to merely provide a single access layer through a platform that virtualizes the data (collect approach). This abstracts away the complexity of the underlying data infrastructure without resulting in data movement or duplication. This can be achieved using data virtualization and semantic layer tools. For a detailed review of these approaches and their strengths and weaknesses, refer to Demystifying Semantic Layers for Self-Service Analytics.

Management and governance of data for A&BI, including security considerations, will be discussed more in the Derive and Implement D&A Governance Framework section.

3.2 Deploy A&BI Tooling

Having built the foundation for successful analytics strategy, deploy analytics technology that fits analytics use cases, data sources, business applications, infrastructure ecosystems and user preferences.

When deploying a new analytics tool, D&A technical professionals must start by assigning the A&BI platform administrator role and examining the tool's licensing structure to determine what resources are needed. For example, in instances where individual licenses are necessary, the platform administrator must understand the various individual license types and establish a process for procuring, assigning and managing them. Where the tool requires the organization to purchase certain "capacities," the D&A technical professional must calculate how much memory and compute are needed in order to estimate how large of a capacity to procure. It is good practice to start with a modest capacity that satisfies the immediate needs of the organization and monitor usage over time to justify the expense of purchasing additional capacities. In many instances, certain paid add-ons and extensions are also necessary to get the full range of capabilities the platform offers. All of the factors mentioned here vary greatly between tools.

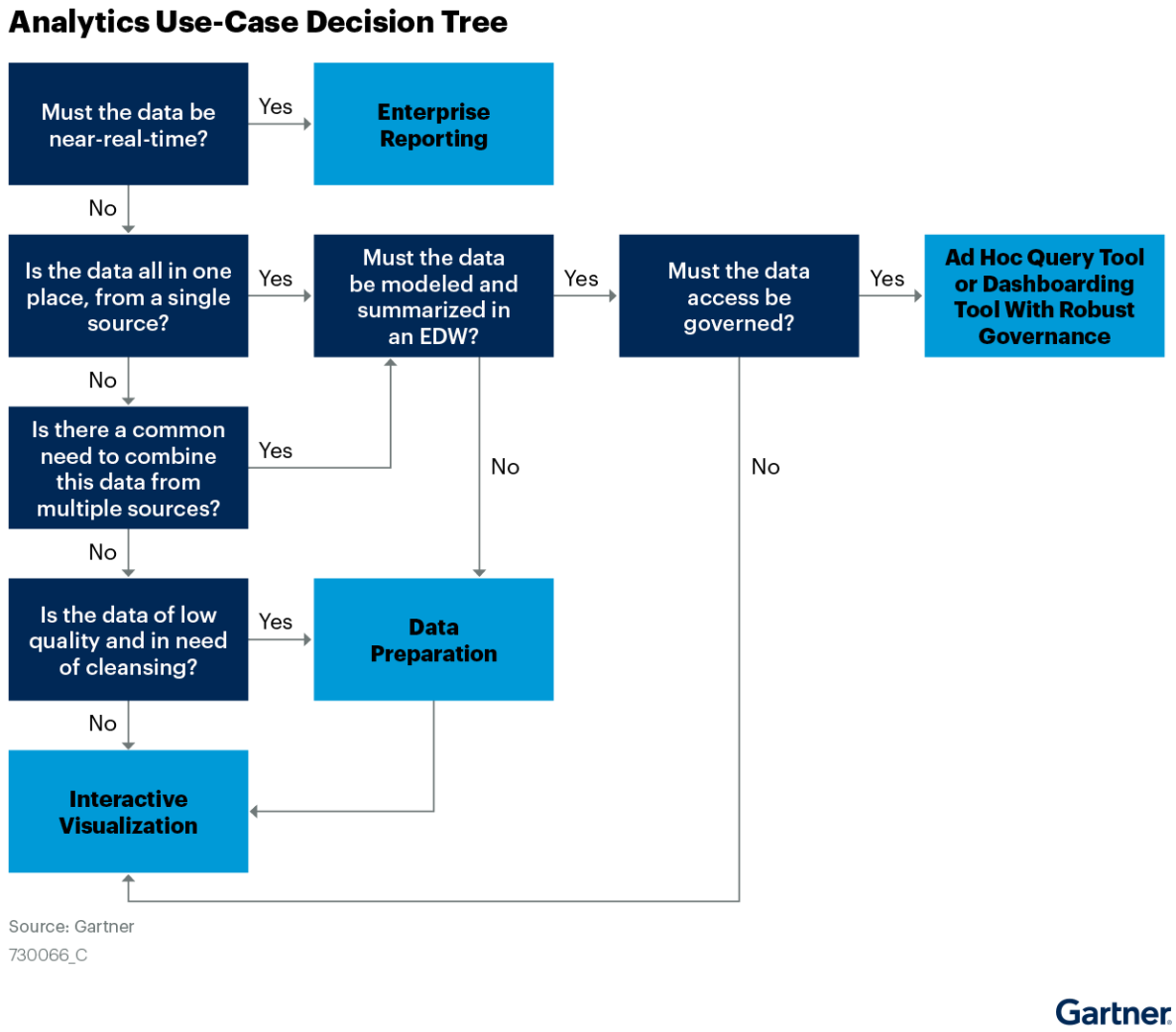
In the initial toolset up, A&BI platform administrators should familiarize themselves with the default tenant-level settings and make an informed decision about which ones to change. Things that can be controlled at the tenant level within a typical A&BI platform include which roles can publish and share content, how content is distributed, who can create workspaces, whether external visuals or add-ons are permitted, and more.

The D&A technical professional responsible for deploying the new analytics tool must collaborate with other IT professionals to ensure smooth delivery. This includes:

- The securities team to control access to data and establish any necessary gateways
- Database administrators (DBAs) to design and deploy the supporting data architecture
- Occasionally, the application development team, depending on how analytics content will be delivered and distributed

If D&A is supporting multiple tools, it should provide a capabilities matrix or a decision tree similar to the one depicted in Figure 5 to align users to the right tool based on their use case.

Figure 5: Analytics Use-Case Decision Tree



Additional governance considerations that can be addressed during the deployment phase are described in the Derive and Implement D&A Governance Framework section.

3.3 Deliver Specialized Analytics Capabilities

In many organizations, there is a demand from certain business units to utilize prepackaged analytics applications that offer solutions tailored toward their particular domains. D&A technical professionals need an approach to manage business unit and domain diversity that results when departments are empowered to buy and manage their own data sources and analytical solutions. The optimal organizational model for this is one that balances centralized and decentralized teams and collaborates within lines of business.

For some ideas of areas and departments to start, the technical professional may find it valuable to speak with business units such as marketing, finance, sales and supply chain, which tend to have significant analytics needs. Even other IT partners, like those within security or IT monitoring, are increasingly leveraging analytics to help to improve their processes. Some examples of domain-specific data and analytics capabilities can be found in the following Gartner research notes:

- Improve CRM and Customer Data With Master Data Management
- How to Modernize a Customer Engagement Architecture
- Streamline and Innovate Your Marketing Team's Customer 360 and Social Media Analytics Programs
- Market Guide for Cloud Extended Planning and Analysis Solutions
- Market Guide for Cloud Financial Close Solutions
- Improving Unstructured Data Security With Classification
- Solution Path for Modern Infrastructure and Application Monitoring

In addition to the domain-specific use cases and technologies mentioned above, there are many analytics use cases that require a specialized set of capabilities that go beyond the functionality of the main A&BI tool chosen for the enterprise. Examples of these include:

- Edge analytics
- Streaming analytics
- Internet of Things (IoT) analytics
- Advanced analytics, such as artificial intelligence (AI) techniques like ML
- Geospatial analytics
- Graph analytics

For more information on some of these specialized analytics use cases, see:

- Deploy Leaner AI at the Edge: Comparing Three Architecture Patterns to Enable Edge AI

- Design IoT Stream Analytics From Edge to Platform
- Streaming Analytics in the Cloud: A Comparative Analysis of Amazon, Microsoft and Google
- Graph Technology Applications and Use Cases
- Evolving Capabilities of Analytics and Business Intelligence Platforms
- Democratize Data Science Initiatives With Augmented DSML

As discussed previously, data and analytics technical professionals will need to enable federated data and analytics architectures to support these diverse analytics requirements. For more information, see Reference Architecture to Enable Self-Service Analytics.

Before Proceeding to Step 4

At this point, the technical professional should have done the following:

- Deployed a data architecture aligned to analytics use cases.
- Established a process for self-service data preparation, as well as a system for moving high-value outputs into production with the appropriate ownership model and checks by a D&A technical professional.
- Deployed generalized and specific analytics tooling needed to support known analytics use cases across the organization.

Recommended Reading for Step 3

In addition to the documents listed earlier in this section, further guidance on deploying D&A architectures to support A&BI can be found in the following papers:

- Reference Architecture to Enable Self-Service Analytics
- Self-Service Analytics Governance With Microsoft Power BI
- Inter- and Multicloud Analytics: Optimize Amazon Redshift, Google BigQuery and Snowflake for Power BI
- Solution Path for Building a Holistic Data Management and Analytics Architecture

- A Guidance Framework for Deploying Data and Analytics in the Cloud
- Exploring Lakehouse Architecture and Use Cases
- Decision Point for Selecting Cloud Analytics Solution Architecture
- Demystifying Semantic Layers for Self-Service Analytics
- Adopting a Logical Data Warehouse
- Comparison of Data Stores to Support Modern Use Cases

Step 4: Operationalize

4.1 Create Analytics COE/CoP

The gradual transformation of an organization's culture is a natural consequence of empowering people through communities supported by something like a center of excellence (COE). In addition to improving employees' professional knowledge, communities significantly benefit the organization by leveraging domain mastery when developing products and serving customers.

By 2024, 75% of organizations will have established a D&A center of excellence (COE) to support federated D&A initiatives and prevent enterprise failure.

COEs provide D&A leaders and technical professionals with the means to empower decentralized communities by supporting coordination, collaboration and consistency across those communities and the central IT department. A COE should encompass (or at least address) a variety of the following key capability types:

- **Organization capabilities:** Defining and enabling required roles and responsibilities and influencing culture.
- **Project capabilities:** Performing management and administrative activities and gauging project performance.
- **Data capabilities:** Identifying trusted information sources and delivering some central analytics.

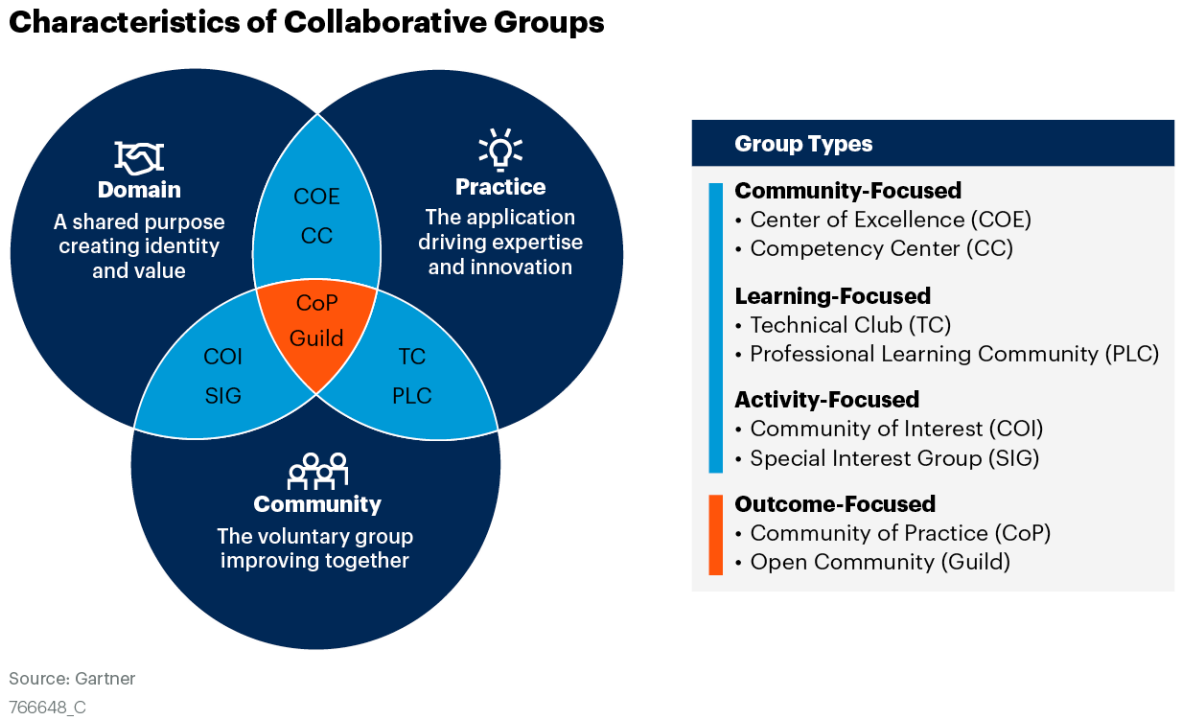
- **Education capabilities:** Fostering innovation and self-service enablement along with related knowledge management activities.
- **Technology capabilities:** Establishing tool and architecture standards.
- **Domain capabilities:** Applied across and within all business processes and functions.

Just like the hub and the spokes need to work together, so do the business and IT, irrespective of where you position the COE. The IT organization and the business must be partners. In this partnership, IT installs and maintains infrastructure, supports data storage, enforces security and governance policies, and evaluates new technologies and tools. By contrast, the business explores new data sources, sets policy and acceptable risk, works on reports and dashboards for business-specific content, and focuses on business value.

There are also alternatives to the COE for D&A leaders and technical professionals to consider. The four main types, as represented in Figure 6, are:

1. **Capability-focused:** COE and competency centers provide formal structure with a capability focus.
2. **Learning-focused:** Technical clubs and professional learning communities have a solid educational focus without the required mandate for change supplied by the domain.
3. **Activity-focused:** Special interest groups and communities of interest offer discussion space, but lack the explicit reinforcement of knowledge through practice.
4. **Outcome-focused:** Communities of practice (CoPs) focus on delivering business outcomes by combining domain, community and practice.

Figure 6: Characteristics of Collaborative Groups



Source: Gartner
766648_C

Gartner

Practitioners create and operate communities of practice to address the most pressing problems. Technical professionals should participate in communities of practice to share experience, build skills, drive innovation and collaborate with peers to solve challenges. For more information on CoPs, see Community of Practice Essentials.

4.2 Evolve to Predictive and Prescriptive

Modernization of analytics architecture should be seen as an iterative process, where components are removed, added and optimized on a recurring basis. As analytics adoption increases and new use cases develop, the emphasis may switch toward enabling more predictive and prescriptive capabilities. To facilitate this, technical professionals must adapt their strategy to account for changing requirements for skills, data, analytical tooling and governance processes.

Typically, advanced analytics are performed by data scientists with specialized training and expertise in techniques like ML model development. Organizations journeying into data science and ML often start by hiring data scientists. However, data scientists are in high demand, and recruiting for these roles in today's competitive landscape is a difficult, and often expensive, task.

To bridge the skills gap, D&A technical professionals can look to some of the more sophisticated self-service BI users from within their own organizations. Advanced self-service users are often interested in extending beyond the typical BI activities of data preparation, analysis and visualization to include advanced statistical analyses and ML model creation. They are in a great position to develop impactful solutions for the business due to their subject matter expertise. Supporting these individuals with additional training, analytics capabilities and data will elevate them from self-service BI users to the role of citizen data scientists. A citizen data scientist is an experienced BI analyst who extracts predictive and prescriptive insights from data while not being as technically skilled as an expert data scientist. Citizen data scientists occupy a hybrid, boundary-spanning role, not a distinct stand-alone position in the organization. For more information on the distinction between these roles, refer to Reference Architecture to Enable Self-Service Analytics.

D&A technical professionals supporting citizen data scientists' activities must consider changing data requirements. Self-service BI benefits from curated, high-quality datasets aligned with specific use cases. However, data science and machine learning (DSML) use cases often require access to a greater volume and variety of data, sometimes in a raw (or close to raw) format. Organizational data may be further supplemented or augmented by synthetic or external data to fill gaps. Data for DSML needs to be provisioned in a secure manner separated from production systems, such as in an analytical sandbox within a data lake environment.

The increasing demand to support citizen data scientists within organizations has had a significant impact on the AI/ML tooling market within recent years. Many DSML and machine learning operationalization (MLOps) vendors have overhauled their platforms to include more drag-and-drop capabilities to make them easier for non-data scientists to use. Certain tools include options for enhanced data preparation and augmented feature engineering, prepackaged AI/ML models, AutoML and model optimization. In addition, these platforms have built-in paths for pushing models into production and managing their life cycles. This reduces (but does not eliminate) the requirements for specialized skills to generate, operationalize and manage ML models. Citizen data scientist training and skills development is discussed further in the Develop Skills by Delivering Specialized Training section.

Leveraging citizen data scientists and supporting them with enhanced training and augmented tooling helps organizations to take their first steps into advanced analytics. Table 1 provides an illustrative mapping of requirements from traditional self-service BI to citizen data scientist-enabled advanced analytics.

Table 1: Mapping How Roles, Capabilities and Processes Change When Evolving From Descriptive and Diagnostic to Predictive and Prescriptive Analytics.

Domain	Self-Service A&BI	Advanced Analytics
Roles and Skills	Self-service BI analyst/business analyst	Citizen data scientist
Data Capabilities	Curated datasets: Often delivered via semantic layer tooling, self-service data mart, semantic layer within A&BI platform, etc.	Large volume and/or variety of data: Can be delivered via an analytical sandbox within a data lake. Often requires external and/or synthetic data.
Analytics Capabilities	A&BI platform	DSML or MLOps platforms
Process and Governance	Self-service analytics governance process	MLOps practices

Source: Gartner

4.3 Repeat Steps 1-4 Regularly

Analytics modernization will not be successful if it is only done once. Instead, it should be an iterative process.

Technical professionals should be prepared to prioritize the initiatives that make the most sense for their organization. Most technical professionals will encounter situations where they have to act quickly to deploy a new analytics capability. In that scenario, they should not go through each substep in detail, but rather prioritize the most important pieces of this modernization framework and only do those.

Sometimes, analytics organizations are suffering due to a large number of crunch-time and rushed analytics decisions that weigh down the organization with technical debt. In such a scenario of unmitigated tool sprawl and self-service chaos, technical professionals may want to deemphasize agility and look for more opportunities for governance, process improvement and tool consolidation.

Analytics modernization is a never-ending journey, but a worthwhile one because it will deliver the insights necessary to drive innovation and success in any organization's mission.

Recommended Reading for Step 4

Consult the following documents for more guidance on creating an analytics center of excellence:

- Community of Practice Essentials

In addition, the following documents provide advice on how to advance your analytics capability toward the predictive and prescriptive, using techniques such as ML:

- Solution Path for Building an Effective Technical AI Strategy
- Essential Skills for Citizen Data Scientists
- Roles and Skills to Support Advanced Analytics and AI Initiatives
- Comparing AI-/ML-Based Systems That Minimize Data Science Requirements
- Democratize Data Science Initiatives With Augmented DSML

Repeat at Each Step

Throughout this journey, D&A technical professionals need to pay attention to factors that can undermine the success of the initiative, such as:

- Resistance to change that can slow the transition to new technologies and the ceasing of old practices
- Inadequate processes and governance over the use of data that results in shadow analytics, data silos and inconsistencies in metrics across reports
- A lack of skills and experience that can lead to errors and ineffective use of resources

Tools can only be successful if you can convince and teach individuals to use them properly. Therefore, it is necessary to incorporate a plan for creating cultural change (change management) and implementing governance over data and analytics into the overall strategy for building a modern A&BI capability. In addition, D&A technical professionals must put together a plan to develop the skills and roles that are needed to improve the organization's data literacy and familiarity with the D&A platform.

The steps below are suggestions for how change management, data and analytics governance and skills development can be addressed during each of the four steps proposed in the current Solution Path for building modern A&BI architectures.

Mitigate Resistance Using Change Management

Step 1: Plan Phase

It is essential to work closely with the business and other relevant stakeholders to learn about the current and desired future state of analytics within the organization. While doing so, it will become evident that some individuals are able to describe what they would like to do with data better than others. Data literacy and experience with analytics are factors here. D&A technical professionals working in a centralized reporting capacity will be very familiar with how difficult it can be for a business user to properly scope out and define requirements for a new report. The same applies here. Therefore, in order for the requirements gathering exercise to be effective, technical professionals must adapt their approaches to suit the groups they are working with.

While brainstorming about use cases, the technical professional should open people's minds to the way they could do things differently. This will serve to convince stakeholders at various levels and positions within the organization of the value of the change — from IT professionals to managers and executives to regular business users. One way to do this is to ask the right questions to get people thinking creatively about data and contextualize things within their current processes and workflows. For example:

- Can they describe some business processes that they find difficult, inefficient or manual that data could potentially improve?
- Do they regularly leverage existing analytics content? And why/why not? For example, do reports lack the essential information to make a business decision?
- Do they have any data-related issues, such as slow-opening reports, poor data quality or inconsistencies in metrics across reports?

- Have they ever tried to create their own analytics content and experienced roadblocks like difficulty accessing and understanding data and poor data quality?
- What do they wish they could do that they can't do now?

As much as possible, try to extrapolate away from "data terms" and have end users describe things in their own words. The requirements gathering exercise may be conducted in the form of focus groups, online surveys, workshops and so on. Understanding the issues the organization is facing will make it easier for D&A technical professionals to build a solution that overcomes the challenges identified. They can focus on messaging that appeals to specific user groups and communicates the direct benefits of the proposed changes, engaging them in the process and decreasing resistance.

Step 2: Design Phase

When rationalizing the existing toolset, technical professionals should expect a degree of resistance from populations regularly using one of the tools that will be retired. This is understandable for a variety of reasons. Individuals experienced in using a particular tool will be forced to learn a new platform and to potentially recreate their content as part of the migration. D&A technical professionals will need a strong argument supported by multiple justifiable reasons for the change.

The decision must be clearly and transparently communicated with the impacted end-user groups. Variables like cost and architectural simplicity will not appeal to end users as much as factors that directly affect and benefit them, so focus on these. For example, demonstrate to self-service users the advanced or augmented capabilities they will gain with the new toolset, improvements to data quality or the ability to automate a particular business workflow.

This also applies to professional BI developers who may be required to shift from using a more traditional enterprise reporting tool to a modern A&BI platform. This group is also more likely to be involved in the actual migration of content from one platform to another. Due to the difference in these technologies and the analytics use cases they cater to, it is not possible to lift-and-shift a report from one environment to another. Instead, a complete redesign is necessary. Therefore, BI developers are faced with the effort not only of learning a new skill, but also of rethinking the way they design and deliver analytics content. D&A technical professionals leading this change should be understanding of the particular challenges that may arise for these individuals throughout this process.

The D&A technical professional needs to differentiate between instances where people are hanging on to an old way of doing things because they don't know any differently versus a genuine need to retain certain tools, capabilities and practices. An example of the latter is where there are critical enterprise reporting use cases that cannot be satisfied by a modern A&BI tool, such as regulatory and compliance reporting requirements. The retiring of one or more tools and migration/consolidation onto another must be done delicately and incrementally to reduce the disruption to the business and resulting opposition.

Step 3: Deploy Phase

When deploying new analytics capabilities and changing processes within the organization, it is essential to avoid a "big bang" approach and attempting to take on too much at once. Instead, changes should be rolled out to the organization incrementally by focusing on the projects and timelines defined within the strategy and roadmap. Projects should be initiated in the agreed order, which must be based on a combination of factors that include project requirements, feasibility and business impact.

Early pilots, POCs and "quick wins" can be used to demonstrate the benefits of the initiative. As D&A technical professionals expand to other use cases, they can lean on the success of earlier projects to convince stakeholders of the value of the changes. Doing so will help to tackle any resistance they might face.

If this is the organization's first venture into self-service analytics and the democratization of data, there will also be some change management necessary on the part of certain IT stakeholders, such as those within security and DBA. The new way of doing things will present additional challenges and risks not typically encountered within a centralized IT model, where all individuals accessing data have training and experience. To ease their concerns, these stakeholders must play a key role in deploying data architecture to support self-service and other modern analytics use cases. The aim is to provision data in a secure, governed manner that minimizes any impact to database performance.

Other organizations may be moving from a model where self-service users were able to extract and prepare data for their analyses to one where curated datasets are provided for them. Here, the benefits of reusability and data standardization must be clearly communicated to justify the reduced flexibility and autonomy. Close collaboration with the business in this instance will help with the transition. It is essential to build datasets that satisfy business use cases and to have a procedure for creating new datasets for use cases that arise or evolve over time. This process cannot be too long and cumbersome. Otherwise, self-service users will be tempted to circumvent the new system and supply their own data by other means.

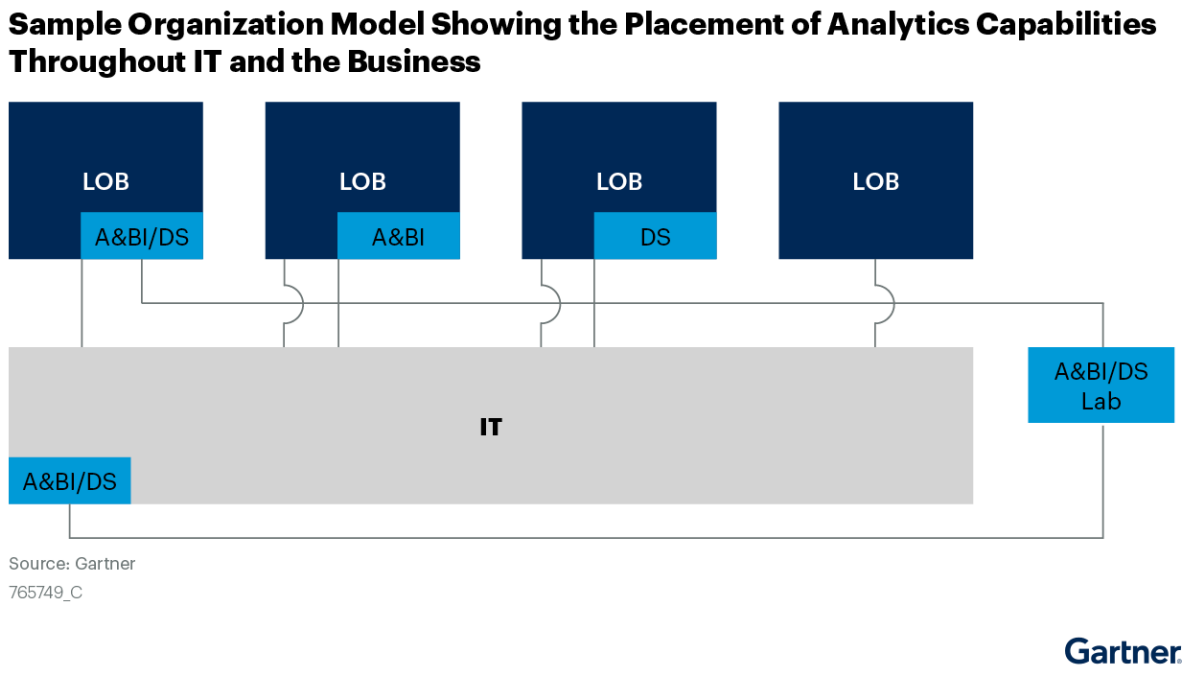
Step 4: Operationalize Phase

To promote the adoption of new analytics capabilities within the organization, the D&A technical professional should employ a variety of techniques to engage and support users. This includes documenting best practices; establishing analytics communities; and creating and maintaining resource repositories containing things like templates, prototypes and training resources.

D&A technical professionals (such as BI developers belonging to a central analytics capacity) and self-service users can have a shared communications channel in a platform like Teams or Slack. This allows users to post questions and details about problems they are facing and get help from others within the community. This elevates some of the burden on IT because users are empowered to solve issues among themselves, rather than having to submit a ticket to IT every time they face an obstacle. This channel also allows IT to provide updates such as new capabilities added, database updates and downtime directly to end users.

To help the business to gain autonomy and promote the development of more complex analytics content, D&A technical professionals can lead and facilitate a “lab” capability. The purpose of the lab is not to serve as a “tech support” for all self-service users across the business. Instead, select self-service users in key positions should be invited to participate in the lab. These users can bring specific projects and use cases to the lab and have the benefit of an experienced technical professional to help guide them through the process of creating solutions and troubleshooting issues. Helping these self-service users to develop content that addresses a business need within their LOB will provide tremendous value while minimizing IT involvement and ensuring that best practices are followed. The support and resources provided by this lab helps to encourage self-service users to take on more challenging use cases than they may have thought possible, given their skill set. Figure 7 illustrates how the lab may be positioned within the organization. This lab may address A&BI use cases only, or it may include more advanced data science (DS) projects like ML model development.

Figure 7: Sample Organization Model Showing the Placement of Analytics Capabilities Throughout IT and the Business



Steps should also be taken to acknowledge the work of analytics content creators throughout the organization. On one hand, managers and senior leaders will recognize their efforts. This visibility is a reward in itself, encouraging the maintenance of these assets and the development of others. On the other hand, demonstrating the value and impact of these solutions to the wider business may inspire others to create their own content.

D&A technical professionals responsible for promoting analytics content throughout the organization can consider creating spotlights like “dashboard of the month.” These may be submitted for consideration to IT by a manager or other content consumers. Alternatively, IT can identify content by monitoring the creation and consumption of analytical assets through monitoring dashboards available to platform administrators. For more information on this, see the Develop Skills by Delivering Specialized Training section.

Methods of promoting new or high-value reports, applications or other analytics solutions can include publishing them via newsletter, distributing them via email or embedding them within an internal webpage. Any of these methods should be accompanied by details of the content developer, the business use case they address and the impact they have had. Analytics developers may also be given the opportunity to present their solutions to senior leaders or other special interest groups as part of a seminar series. This gives them the opportunity to describe their rational, development process and challenges they faced. It also provides a forum for providing feedback to improve the content.

Derive and Implement D&A Governance Framework

Step 1: Plan Phase

Good data and analytics governance is critical to business success. However, organizations today are being failed by their business practices, and a main culprit is poor (or no) data and analytics governance. Getting started with an effective data and analytics governance approach cannot happen overnight. It requires planning and coordination with senior business and IT stakeholders. This will require new focus, new investment, new processes and new skills in the enterprise (though it may not require new dedicated resources). Furthermore, the pace of change will be limited by the level of maturity, culture and risk appetite.

It is important to create a set of shared definitions, principles and policies, but this requires business participation, and often starts with conflict. A disagreement, discrepancy or reconciliation issue indicates a trigger-point event that shows stakeholders care about the data. For example, consider a situation where the marketing department and sales teams both report different answers when the CEO asks “how many customers do we have, and what are they worth.” Such incidents typically descend into arguments about “who is right,” rather than being used as an opportunity to call attention to changes in business practice that can lead to better results.

As such, a governance activity that can be conducted during the initial requirements-gathering exercise is to start to compile a business glossary with definitions of terms and key metrics. At this point, the technical professional can also identify key stakeholders across IT, the business and senior leadership that should come together as part of a governance board and/or stewardship council.

Step 2: Design Phase

A governance board and stewardship council are needed to form working groups to establish policies around access to and use of data. Table 2 provides examples of questions that should be addressed during the formation of policies.

Table 2: Sample Issues for the Governance Board and Stewardship Council to Discuss

Data access	■ Is there a need to restrict access to data based on factors such as the individual's level of seniority within the organization or the department they belong to, like finance or HR? ■ Do we have sensitive data, such as Personally Identifiable Information (PII)? ■ Do we have regulatory requirements that prevent the movement of data from one geographic location to another? ■ Do we want to automatically grant access to users based on their role or other factor, or require them to submit a request with justification for the use of the data?
Use of data	■ Do we have data that shouldn't be permitted for certain use cases? ■ Do we need to restrict which data sources can be combined with others? ■ How do we want users to share and disseminate content? ■ How long should data be retained?

Source: Gartner

Once policies have been formed, the D&A technical professional leading the design of the data architecture must translate them into tangible measures to enforce these policies and/or monitor user compliance. This must be done in collaboration with data architects and data security professionals who will be involved in the implementation of these measures during the deploy phase. This will extend to IAM policies, RLS and OLS, A&BI platform workspace permissions and roles, and other tenant-level A&BI platform settings. In addition to these, the D&A technical professional should assess the out-of-the-box monitoring dashboards of the analytics platforms they will deploy to determine whether these are sufficient for measuring user engagement and identifying behaviors that breach governance policies.

Step 3: Deploy Phase

Gartner recommends a federated A&BI deployment, where IT and the business partner to deliver analytics to the organization in a manner that balances control and agility. IT deploys and supports the data platform and related infrastructure, frames global policies, provides guidance around best practices, and monitors adoption and user activities. This includes, as mentioned above, implementing security measures within data sources to control access to the data, like IAM, RLS and OLS. It also means enabling, disabling or limiting certain settings at the A&BI platform tenant level in order to limit behaviors that risk breaching governance policies, such as sharing data with the wrong people.

Out-of-the-box analytics platform monitoring solutions give administrators insight into tenant health with factors like memory consumption, data refresh load times and CPU usage. Administrators can also monitor user behaviors like the creation of content (like datasets, reports, dashboards and applications) and their consumption. Typically, administrator dashboards give only a high-level view of platform activities. However, in most cases, more detailed audit logs are available for administrators to query.

During the previous step, the A&BI tool's out-of-the-box monitoring solution should have been evaluated. Based on this, the platform administrator should determine whether a custom monitoring solution is needed. To create a custom monitoring solution, a process for regularly extracting and storing relevant data from the audit logs must be established. Once data has been schematized and persisted to a relational store, it can be analyzed within the A&BI platform or any other analytics tool. Alerts and thresholds may be set to help flag certain behaviors for the technical professional to investigate.

On the business side, data stewards enforce policies within LOBs, and self-service analysts are responsible for owning and securing any datasets they create within the A&BI platform. For this, a key consideration is the mode of connecting to the underlying data. If a report is built using a direct connection to an external data source, like a data warehouse, single sign-on (SSO) is needed to authenticate the credentials of content consumers to ensure proper access to the data. Beyond just IAM, SSO can be used to preserve RLS and OLS from source databases. However, this only works in some cases because only some A&BI platforms have this capability and, even then, typically only support it for certain data sources.

If data is imported into the A&BI platform, it loses any security protocols implemented at source. For example, row- and object-level security within a data warehouse will be lost when a subset of the data is copied into the analytics tool because it will mirror the author's view of the data. Instead, it will be the responsibility of the business user who created the dataset to replicate appropriate RLS and OLS and share the data appropriately. IT must make sure business users understand the implications of this and have the skills to put it into practice. This is another reason why it is advantageous for D&A technical professionals, such as BI developers, to create shared datasets for the business to leverage. It reduces the risk that data will be exposed to users beyond their entitlement.

Step 4: Operationalize Phase

As adoption of the analytics platform increases, D&A technical professionals must automate, operationalize and delegate as many governance activities and responsibilities as possible in order to keep up with increasing demands. Clearly documenting and communicating best practices and governance policies is essential. These should be stored in a single, easy-to-access repository, such as a shared drive. This function may be owned by the analytics COE and supported by data stewards positioned at the local level. Within the various business units, data stewards can:

- Help to support these policies
- Serve as point of contact between the LOBs and the COE or central governance board
- Be the point person for others within their department to discuss any issues or ambiguity

Monitoring of platform health and user activities will help the D&A technical professional manage resources, maintain oversight and intervene when governance policies are violated. Automation should be incorporated as much as possible into this process. For example:

- Orchestrating of the pipeline to extract data from audit logs, transform it and deliver it to the monitoring dashboard
- Setting alerts and thresholds that trigger an application workflow to automate sending email warnings or alerting the technical professional to things like excessive consumption of resources or behaviors that violate governance policies

To accompany this, there must be a feedback loop with end users. When issues are detected, there should be some form of intervention to discourage the behavior from reoccurring. This could be something as simple as providing additional training or guidance to the user. In order to determine an appropriate course of action, the technical professional may need to perform a root cause analysis. Identifying where and why a problem arose makes it easier to find a solution. For example, if access to data is too complicated and difficult, users may resort to sharing data among themselves in the form of spreadsheets sent via email. Understanding this pattern and the underlying reason for it may lead D&A technical professionals to review and modify their current process for applying for data access privileges.

To cope with scaling analytics within organizations, particularly in cases where multiple tools are in play, D&A technical professionals can also consider additional tooling to help manage and govern the proliferation of data, analytics content and metrics. Examples of these include analytics catalogs, semantic layer tools and metric stores. To be effectively implemented, these tools should be implemented in the data layer. This enables the data to be capitalized on for a variety of purposes and consumed by multiple A&BI platforms.

A final point to consider here is the development life cycle and ownership model for analytics content. It is extremely common for self-service users to create and publish content and then move positions within the organization or leave the company entirely. Therefore, as part of development best practices, D&A technical professionals should instill the importance of good documentation to capture salient details about the report or dashboard that would enable another user to maintain it in the author's absence. They must also establish procedures for transferring ownership from one business user to another and from a business user to a central BI team. The monitoring solution discussed above can help with this process because it will typically provide administrators with an inventory of the reports, dashboards and applications within the A&BI tool and their authors. However, this will only provide a view within a single A&BI tool. An analytics catalog, on the other hand, can provide a complete view of the analytics content across multiple analytics tools.

Recommended Reading

- Data and Analytics Governance Approaches for the Technical Professional
- Self-Service Analytics Governance With Microsoft Power BI
- Building a Comprehensive Governance Framework for Data and Analytics

Develop Skills by Delivering Specialized Training

Step 1: Plan Phase

Data literacy is the ability to read, write and communicate data in context. A data-literate workforce is essential for organizations chasing the elusive goal of becoming more "data-driven" in their decision making. Technical professionals should evaluate current competency early in this initiative and define the required skills to determine training focus and objectives. This may take the form of a skills assessment that measures data literacy and other analytical skills at the organizational level and across subgroups. For example, the assessment may highlight that some areas of the business already have greater levels of data literacy than others.

Most organizations conduct a skills assessment such as this by utilizing self-report questionnaires. These surveys typically contain a list of statements of proficiencies and the individual responds with whether or not they agree those statements apply to them. For example, “I can explain the following terms confidently: mean, median, mode and standard deviation.” More in-depth assessments are also possible. However, they are less practical because they require more time and resources to develop and administer. Although surveys are an effective way of reaching a larger audience within the organization, they are subject to certain biases and therefore should be analyzed only in aggregate. A sufficient response rate is needed to establish a representative sample and minimize the effects of noise. This assessment serves as a baseline measure to compare against any improvements captured over time.

When discovering analytics use cases and desired business outcomes during the planning phase, D&A technical professionals will be able to set expectations as to the skills self-service users and full-time BI developers will require. This extends to data literacy. However, it will also include experience with analytical tools, data wrangling, building queries, selecting appropriate visualizations, report design best practices and more.

Step 2: Design Phase

As organizations adopt more new technologies to support various analytics requirements, there is increasing demand for user training. This training often focuses more on how to use new tools and products when training users. This alone is not sufficient to improve users’ capabilities. Organizations have to prepare and empower users for business or procedure changes. This can be achieved through effective training programs and strategy. A lack of appropriate skills will undermine the success of the initiative, resulting in low levels of platform adoption and issues like inefficient use of resources.

Skills required will vary by analytics use case and the tooling involved. For example, the skills needed to build a pixel-perfect report in an enterprise reporting tool will differ from those needed to build an interactive dashboard. Similarly, the mode of content distribution also has certain demands on end-user skills. For instance, it is a lot more challenging for a self-service user to embed a report into a custom webpage than it would be to deploy the content as an application within the A&BI platform’s out-of-the-box mobile application. Finally, consider the additional skills needed for self-service users that are permitted to create their own datasets. These individuals not only need data wrangling skills, but also need to know how to implement RLS and OLS in the imported dataset before they can safely share it with other self-service users.

Therefore, during the design phase the D&A technical professional responsible for supporting end-user enablement and adoption of the new platform should create a list of relevant skills and design a comprehensive, modularized training program. It must cover topics foundational to data literacy and also topics like:

- Advanced analytical techniques, including specialized skills that align to the use cases identified.
- How to use analytical tools, such as the A&BI platform.
- How to access and understand the organization's data assets. If the organization has a data catalog or other relevant tools here, include these in the training.
- How to create effective data models and best practices for report development that balances performance and data security.
- Understanding data and analytics governance policies and how these translate to actions within the platform, like distribution best practices, how to implement RLS and OLS, workspace roles and permissions, and so on.

This training may take many forms: instructor-led classroom sessions, online e-learning modules, quiz-based training, workshops and contextualized training performed "on the job." Learner styles vary a lot. What works for one set of individuals may not work for another. As such, offering a diverse training program with several delivery options will allow users to select the approach that best suits them. By modularizing the training, the D&A technical professional can build several recommended learning paths tailored toward developing a certain set of skills that align to use cases or roles.

Step 3: Deploy Phase

As mentioned above, there are several methods for delivering training to the organization. D&A technical professionals designing upskilling paths for analytics can choose one or multiple modes of learning, such as classroom-based learning (either in-person or virtual), workshops, self-paced online learning or even game-based training.

Successful training programs are flexible and provide a variety of options to suit user preferences and learning styles. When these techniques are used in combination, learning and retention are greatly enhanced. For example, classroom learning may be needed to introduce topics and provide a foundation for users. However, this alone is not sufficient to build proficiency in any topic. Working through generic examples in a classroom setting is unlikely to prepare users for the real challenges they may encounter when attempting to build their own analytics content.

Instead, these skills should be contextualized by getting the user to apply them to a specific problem they are trying to solve that is relevant to their role within the organization. They may be encouraged to do this in their own time or may even be guided through the process by bringing a specific problem to a workshop. Alternatively, they could be assigned to a working group to develop a solution as a team. Completing a project can even be made into a game or competition. There are so many options — you just have to get creative!

Step 4: Operationalize Phase

D&A technical professionals should think strategically about maximizing the reach of their training programs. They can leverage the skills and experience of a selection of high-performing users positioned within the LOBs to scale training efforts as adoption increases throughout the organization. This can be achieved by recognizing certain users as “self-service champions.” Self-service champions could be made training leads within their LOBs, making them responsible for delivering training to other users as part of the self-service analytics onboarding process. Essentially, this means the business will be training the business. They can also serve as the initial point of contact when self-service users within their purview experience issues. Problems the self-service champion cannot resolve can then be escalated to the COE or IT.

The analytics COE can establish documentation, best practices, resources and a community for the business. In addition, D&A should provide the following services to keep the user community engaged:

- Lunch-and-learns with a different topic each session, held at regular intervals (e.g., once a month)
- Set drop-in office hours every week, such as 11 a.m. to 1 p.m. every Wednesday
- Consulting/advisory services where users can submit prototype reports to a technical professional for feedback on how to improve

- Monthly meetups for general and specific interest groups
- Seminar series demonstrating new platform features, presenting “hot” topics or giving content developers the opportunity to present work-in-progress and receive feedback from their peers and technical professionals alike

These services support end users in their development while giving them further opportunities to learn new skills, gain different perspectives from across the business and receive feedback.

As the organization matures and more use cases for predictive and prescriptive analytics emerge, training programs must also evolve. These use cases require a different, very specialized set of analytics skills. This is true despite the ever-increasing ease of use of certain DSML platforms. Individuals who want to graduate from traditional self-service BI to advanced analytics must learn how to successfully apply pretrained AI/ML models, utilize and scrutinize AutoML, and understand the ML model development life cycle, including operationalization of ML models (MLOps). Further details on the citizen data scientist role and the skills required can be found in Roles and Skills to Support Advanced Analytics and AI Initiatives.

Recommended Reading

- Essential Skills for Citizen Data Scientists
- Roles and Skills to Support Advanced Analytics and AI Initiatives
- Self-Service Analytics Success With Metrics, Data Literacy and Organizational Models
- Self-Service Analytics Governance With Microsoft Power BI
- Assessing Online Learning Platforms for Technical Skills Development

Evidence

[1] **Chief Data Officer Survey, 2020.** This study was conducted to explore the business impact of the CDO role and/or the office of the CDO. The research was conducted online from September through November 2020, among 469 respondents from across the world.Respondents were required to be the highest level data and analytics leader, the chief data officer, the chief digital officer, or the leader with data and analytics responsibilities in IT or in a business unit outside of the IT organization. The survey sample was gleaned from a variety of sources (including LinkedIn), with the greatest number coming from a Gartner-curated list of over 3,450 CDOs and other high-level data and analytics leaders. The survey was developed collaboratively by a team of Gartner analysts and was reviewed, tested, and administered by Gartner's Research Data and Analytics (RDA) team.

Document Revision History

Solution Path for Modernizing Analytic Architectures - 18 March 2021

Recommended by the Author

Some documents may not be available as part of your current Gartner subscription.

Solution Path for Building a Holistic Data Management and Analytics Architecture

Solution Path for Building an Effective Technical AI Strategy

2022 Planning Guide for Analytics and Artificial Intelligence

Analytics, BI and Data Science Solutions Primer for 2022

Reference Architecture to Enable Self-Service Analytics

Demystifying Semantic Layers for Self-Service Analytics

Evolving Capabilities of Analytics and Business Intelligence Platforms

Creating a Data Strategy

A Guidance Framework for Deploying Data and Analytics in the Cloud

Migrating Enterprise Databases and Data to the Cloud

Table 1: Mapping How Roles, Capabilities and Processes Change When Evolving From Descriptive and Diagnostic to Predictive and Prescriptive Analytics.

Domain	Self-Service A&BI	Advanced Analytics
Roles and Skills	Self-service BI analyst/business analyst	Citizen data scientist
Data Capabilities	Curated datasets: Often delivered via semantic layer tooling, self-service data mart, semantic layer within A&BI platform, etc.	Large volume and/or variety of data: Can be delivered via an analytical sandbox within a data lake. Often requires external and/or synthetic data.
Analytics Capabilities	A&BI platform	DSML or MLOps platforms
Process and Governance	Self-service analytics governance process	MLOps practices

Source: Gartner

Table 2: Sample Issues for the Governance Board and Stewardship Council to Discuss

Data access	■ Is there a need to restrict access to data based on factors such as the individual's level of seniority within the organization or the department they belong to, like finance or HR? ■ Do we have sensitive data, such as Personally Identifiable Information (PII)? ■ Do we have regulatory requirements that prevent the movement of data from one geographic location to another? ■ Do we want to automatically grant access to users based on their role or other factor, or require them to submit a request with justification for the use of the data?
Use of data	■ Do we have data that shouldn't be permitted for certain use cases? ■ Do we need to restrict which data sources can be combined with others? ■ How do we want users to share and disseminate content? ■ How long should data be retained?

Source: Gartner