The Modern Analytics Platform

Balancing Dual and Dueling Imperatives

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About the Author

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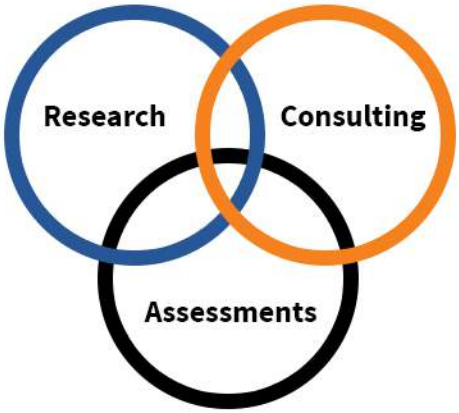
About Eckerson Group

Eckerson Group is a research and consulting firm that helps business and analytics leaders use data and technology to drive better insights and actions. Through its reports and advisory services, the firm helps companies maximize their investment in data and analytics. Its researchers and consultants each have more than 20 years of experience in the field and are uniquely qualified to help business and technical leaders succeed with business intelligence, analytics, data management, data governance, performance management, and data science.



Contents

Executive Summary

A modern analytics platform (MAP) is the culmination of almost 30 years of evolution in the business intelligence (BI) tools market. It is a proverbial one-stop shop that supports all modes of BI and all types of business users. But more than just a collection of tools, functions, and features, a MAP considers the trade-offs between different modes of BI and, like a good marriage counselor, provides a bridge between them.

For instance, a MAP supports both top-down and bottom-up BI that marries the worlds of self-service and governance in a single platform, using permissions, virtual workspaces, and promotion pathways. It also marries formal and ad hoc design methods by providing a rich development environment for IT and business developers as well as a canvas for power users to create data mashups and self-service reports and visualizations. Finally, it provides an adaptable data architecture that delivers both scalability and performance to support many workloads and use cases.

A MAP is designed from the ground up to run on modern computing platforms: namely, the Web, cloud, and mobile devices. It also uses microservices and an open, feature-rich application programming interface (API) that empowers a community of developers to create an ecosystem of third-party add-ons, extensions, and utilities that enrich the MAP well beyond the resources and imagination of the platform vendor.

In short, a MAP is BI for the modern world. At a time when extraordinary gains in computer processing have transformed every facet of our personal and professional lives, a MAP applies the same power and vision to improving the way individuals and organizations turn data into insights and action.

BI for the Modern Era

Technology has transformed our world. The way we work, play, shop, interact, and communicate has changed forever thanks to exponential advances in the price/performance of networking, computing, and data processing infrastructure. Experts now say that hardware has caught up with our imagination, freeing software developers and entrepreneurs to create and sell innovative new applications and services for the modern world.

Rising Expectations

Consumer World. In the last decade, people's expectations for what technology can do have skyrocketed. Empowered by smartphones, wireless computing, fast Internet, ubiquitous search, and smart cloud services, consumers worldwide now expect:

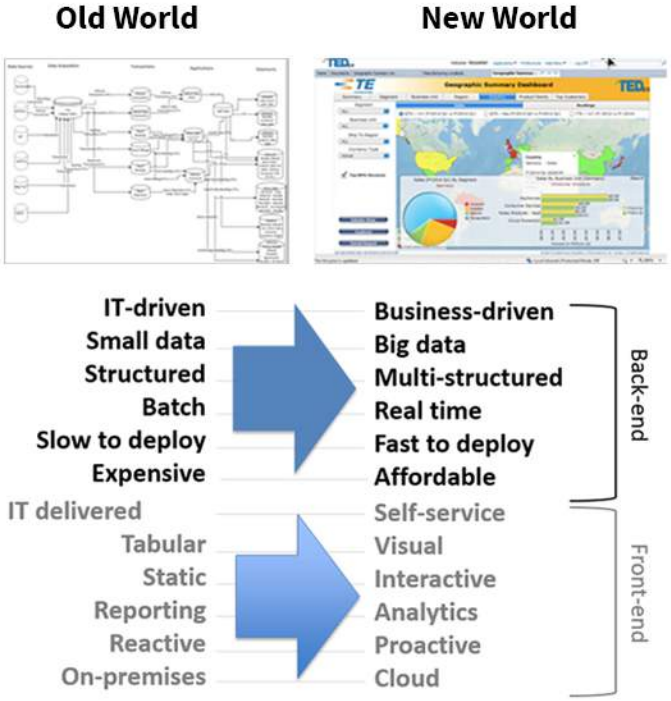
- **One touch, real-time access** to any person, application, or information anywhere in the world. (And very soon, voice commands will replace touch as the preferred user interface.)
- **Personalized, proactive service** where applications automatically know who we are and what we want, sometimes before we know ourselves.
- **Frictionless transactions** that take only a click or two to go from browsing to payment to delivery, revolutionizing the shopping experience with push-button convenience.
- **Free or very low-cost** goods and services delivered to our doorsteps within a day or two with free shipping.

Business World. On the commercial side, companies are racing to duplicate the consumer experience with corporate data, applications, and services. As they adopt agile development techniques, open application interfaces, and self-service tools, business users now expect to:

- **Try before they buy** with freemium models, free trials, and open source software. Organizations now try software before they invest a lot of money into it.
- **Fail fast and iterate** to remain relevant. Business developers want to build solutions quickly, getting continuous business feedback to deliver better products faster.
- **Open up to grow up.** Developers recognize they can't build everything, so they now push development to end users equipped with self-service tools and third-party developers who extend applications with custom functionality.
- **Data-driven products.** Companies now add data analytics to all products and services to increase value, improve customer service, or generate revenue.
- **Disrupt themselves.** To avoid getting "Uberized," companies now cannibalize their own products before nimble, tech-savvy competitors do.

BI Follows Suit

Figure 1. The Analytical Revolution



Business intelligence (BI) benefits from the technology innovations that have rippled through the consumer and business worlds. BI—which consists of the tools, technologies, and techniques that turn data into insights and action—is undergoing a major transition from the "old world" to the "new world." (See figure 1).

The old world of BI is driven by the information technology (IT) department. IT builds solutions using standard tools, processes, and architectures to ensure proper scalability, performance, availability, reliability, governance, security, and reusability. The casualties of this IT-centric approach are agility, flexibility, and usability for the business user.

In contrast, the new world of BI is driven by power users in business units who use self-service discovery tools to

build custom dashboards and charts that address business needs and monitor performance in a fast, agile manner. The casualties here are the things corporate IT delivers, chief among them scalability, reliability, and governance.

Big Data. In addition, the advent of big data has dramatically altered the content that users monitor and analyze. Data today is voluminous, multi-structured, and fast-moving, even as the systems that capture, store, and query data have become significantly cheaper, operate closer to real time, and are faster to deploy.

Analytics. BI software itself has changed, evolving from tabular, page-bound reporting software to highly visual, interactive, analytical software that makes it easier for business users to monitor performance, compare trends, and identify correlations and anomalies. Rather than report on what has happened, the software makes it easier to see what is happening and work proactively to improve the situation.

BI Modernization Required

Given the way technology is changing the contours of consumer and business computing in general and BI software in particular, it behooves every organization to rethink its BI environment. This includes not only BI software, but also the data architecture and organizational models that support analytics. Every organization needs to modernize its BI environment from top to bottom to avoid being disrupted internally by its own business users—or externally by nimble, data-driven competitors.

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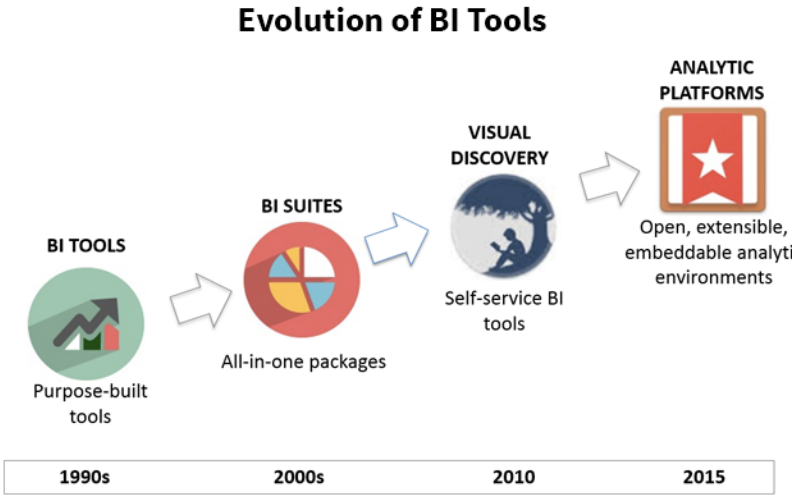
New Role for IT. Powerful, new, open, inexpensive data processing technology has changed the way organizations flow data from source to target for analysis and reporting. At the same time, new analytical tools have empowered business users to capture data where it resides, and then model and analyze it without IT intervention. As business users become data-savvy BI developers, organizations need to rethink IT's role and how IT interfaces with business users and customers. Rather than dictating how, where, and when things get built, IT must facilitate development by the business and for the business.

The Modern Analytics Platform

Evolution

BI Tools. BI software has evolved considerably since its introduction in the early 1990s. (See figure 2.) At that time, vendors shipped purpose-built tools designed to support a single mode of BI, such as reporting, OLAP, ad hoc query, and so on. These products empowered business users with data-driven desktop applications. But organizations quickly became inundated with different tools from different vendors. Many organizations had dozens of BI tools, many of which had redundant or overlapping capabilities.

Figure 2. Evolution of BI Products



BI Suites. Starting in 2000, BI vendors began offering a complete portfolio or suite of BI tools to support one-stop shopping for enterprise customers. Some vendors built each component in the suite, while others aggressively acquired components; most did both. Some suites were highly integrated using a common architecture, but most were a collection of disparate tools with a common graphical user interface (GUI) to tie them together. As a result, the suites were not easy to install, configure, tune, administer, or use. These tasks fell to corporate IT, which became the primary buyer of enterprise BI suites and the primary developer of enterprise BI applications.

Visual Discovery Tools. By 2010, a new generation of BI vendors began shipping lightweight, business-friendly BI tools that didn't require an IT person to buy, install, and configure. These highly interactive, self-service discovery tools caught on like wildfire, becoming a de facto enterprise standard despite protests from corporate IT. Today, many companies suffer the downsides of self-service BI tools: namely, the lack of governance, scalability, security, and complexity that are the hallmark of IT-driven solutions.

Modern Analytics Platform. Today, organizations seek BI products that blend the best of both self-service and IT-driven approaches in a single, integrated platform (not a suite of products) that is comprehensive, open, extensible, and embeddable. A modern analytics platform—MAP for short—supports a community of developers and partners who contribute applications, extensions, and utilities that turn the platform into an analytics ecosystem. Moreover, the platform supplements "run the business" reports and dashboards with "change the business" analytics that help forecast or predict events and prescribe optimal actions.

Design Characteristics

A MAP combines the latest technology advances with analytics best practices culled from 25 years of BI deployments. It reconciles dual—and often dueling—forces that govern the way organizations consume information and deliver insights.

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Dual Forces. For instance, MAP balances self-service and governance, performance and scalability, enterprise and business unit deployments, and speed and standards. In essence, a MAP pulls disparate business users and groups together on a common platform that supports a range of conflicting requirements.

The definitive characteristics of a MAP are that it is *modern*; it delivers all types of *analytics* for all types of users; and it's a *platform* for developing custom analytics applications. Let's examine each of these qualities.

Modern

Design First. Unlike traditional enterprise BI products, a MAP is built from scratch to run on modern computing platforms. It carries no baggage from desktop and client/server platforms or early Web architectures with their thick clients or slow, HTML-only interfaces. Modern analytics platforms are *designed first* for (thin-client) Web, mobile, and cloud computing platforms and application programming interfaces (APIs).

1. **Thin-client Web.** With HTML5, client-side JavaScript frameworks (e.g., AngularJS) and lightweight API servers (e.g., Node.js, Rails or Python), thin-client Web applications can now **match the functionality and performance** of desktop and "fat-client" Web applications. For BI products, this means that a Web browser becomes the de facto client for business users, developers, and administrators, even when they are disconnected from the network. Without desktop code to maintain, a MAP is much easier to deploy, scale, upgrade, and secure. The only people who cry foul are data renegades who use desktop tools to create data silos.

2. **Mobile.** Smartphones and tablets have become ubiquitous. Many working professionals use the devices to analyze corporate data, so a modern analytics platform provides seamless support for mobile platforms. Reports, dashboards, and discovery environments must work equally well on small form factors. MAP-based applications have responsive displays that adjust dynamically to the screen size of the device. In addition, MAP authors can see how their report or dashboard will display on various devices before publishing.

3. **Cloud.** Modern analytics platforms are inherently multi-tenant and run natively on private or public clouds. This allows BI administrators to create separate virtual instances of the MAP for each internal or external customer. (Or, more typically, control access to a single BI instance via granular permissions.) Each instance inherits the properties of the master—including data models, content, and BI functionality—but tenant administrators can configure and extend the master to support unique local requirements. In turn, central BI administrators can upgrade the master environment and propagate changes instantaneously to all downstream instances, keeping every tenant in sync and avoiding expensive software upgrades.

4. **API.** Modern analytics platforms are built from the ground up using a microservices architecture and a rich application programming interface (API). Rather than wrap an API around existing code, the MAP itself is designed as a series of granular services that can be called by internal or external applications via the API. This makes a MAP an ideal development platform for creating custom analytic applications.

Pricing and Purchasing. Other elements of "modern" computing are progressive pricing and frictionless purchasing. With the advent of open source software and "one-click" transactions (e.g., via Amazon.com), software vendors are abandoning complex perpetual pricing models in favor of freemium and subscription models. Some adhere to the first tenant of progressive pricing—transparency—by publishing prices for all to see.

Other elements of "modern" computing are progressive pricing and frictionless purchasing.

Progressive pricing doesn't always look like a bargain, given the additive nature of subscription services. But compared to perpetual licenses, subscription services are straightforward and predictable, making it easy to budget for them as an operational rather than capital expense. In addition, subscriptions don't contain hidden surprises, such as an expensive BI surcharge for upgrading BI servers with faster processors.

Subscription models usually have three to four pricing tiers based on a number of variables such as consumption levels, types of functionality, number of connectors, or amount of data storage. Most MAP vendors use free trials rather than freemium plans to give customers the opportunity to try before they buy. Increasingly, customers purchase MAP licenses on public cloud platforms such as Amazon Web Services without ever contacting the MAP vendor, taking the friction out of purchasing and deploying the software.

Analytics
is the new term that describes the tools, technologies, and techniques that turn data into insights and action. (Business intelligence used to convey the same thing until it became equated with reporting and dashboard tools.) As such, a MAP is designed to support any mode of BI and any type of business user or developer, either individually or in a team.

1. **Any mode.** A MAP supports every type of BI—from production reporting, dashboards, OLAP, and scorecards to ad hoc reporting, visual discovery, alerting, prediction, and what-if analysis. Each mode runs on the same hardware and software architecture (i.e., platform), utilizes the same services, engines, and metadata, and sports a common graphical interface that makes it easy for users to learn and use all the functionality in the product. Moreover, the BI modes are functionally integrated. For example, business users can turn an ad hoc query into a production report, or they can use drill-anywhere functionality to move from a dashboard to a dimensional chart down to detailed data in tables. Likewise, report authors can incorporate predictive models into reports and dashboards.

2. **Any user.** With its comprehensive set of BI functionality, a MAP supports all types of business users. This includes casual users who need silver service (i.e., tailored reports and dashboards delivered "on a silver platter") and power users who need true self-service (i.e., ad hoc data set and report creation). MAPs also support a variety of developers, including Web developers who write scripts (e.g., CSS, HTML, JavaScript), application developers who write code (e.g., JavaScript, Python, Java), and BI developers, who use point-and-click, SQL, or proprietary SQL-like languages to build applications.

3. **Any data.** Traditional BI tools and suites only work with relational databases with specific types of dimensional schema. But MAP products can query any database or application located on-premises or in the cloud. They can also query both structured and unstructured data, as well as data at rest in a database or in flight from a streaming data feed. They can also query small and large data sets stored either in a SQL or non-SQL database, file system, or in-memory cache or database. In short, MAP products are more flexible than their forebears, although it's still better to model data and store it in a workload-optimized system to ensure the highest levels of performance.

4. **Any team.** Because decisions aren't made in a vacuum, MAP products provide rich collaboration features that enable business users to discuss the findings in a report, dashboard, or visualization. MAPs store these annotations and threaded discussions, creating a valuable audit trail to aid decision-making. Business users can also use social media techniques such as follow, like, and rate to deepen their connections with key players in the company. Enabling business users to see which data and reports their peers follow creates social relevance cues that drive BI adoption. In the near future, MAPs will incorporate artificial intelligence (AI) algorithms that automatically mine data and notify users of significant trends and anomalies, whether in written text or spoken words. AI robots for analytics will both fuel and supplement team-based discussions.

Platform

Development Environment. Finally, a MAP is both a development environment and a community. As a development environment, a MAP has the following characteristics

1. **Easy to use.** A MAP makes it easy for non-programmers or non-IT professionals to design and deploy reports, dashboards, and custom applications without coding. For instance, business users can personalize report views or a BI portal interface to meet their information needs, while power users or Web developers can configure (i.e., "white label") the tool's graphical user interface to conform with corporate styling or to create a rich, interactive analytics application without IT assistance.

2. **Open.** MAP products are open and easy to integrate with other applications. Developers can connect third-party applications to MAP products via standard access methods, such as SQL and ODBC/JDBC, or integrate at a deeper level using the MAP product's API. Third-party applications or services can query the MAP's data or semantic layer or call its query, charting, reporting, and other engines and services. MAP products can also pump data to third-party applications, providing a two-way interaction that can optimize business processes.

3. **Extensible.** The MAP API also makes it easy for developers to extend the platform in a variety of ways. They can build new data connectors, add new chart types, embed new metrics and analytic functions, and create new administrative utilities, among other things. But more importantly, a MAP product allows users to configure changes in the product with minimal or no coding. They can use a graphical interface or macro or scripting language to make simple changes.

4. **Embeddable.** Finally, because MAPs are open, configurable, and extensible, developers can easily embed MAP products inside other applications. Such integration can be done via URLs or iFrames, but also at the services level using a MAP API.

Development Community. Because MAP products are easy to design, open, extensible, and embeddable, they give rise to a community of developers who build extensions, add-ons, integrations, and applications on top of the MAP platform. The community extends the platform in innovative ways the vendor didn't consider or imagine, and provides resources the vendor could never afford as a commercial company. In other words, the platform functions as an innovation and marketing engine, making the product much more valuable than if it were a closed, proprietary system.

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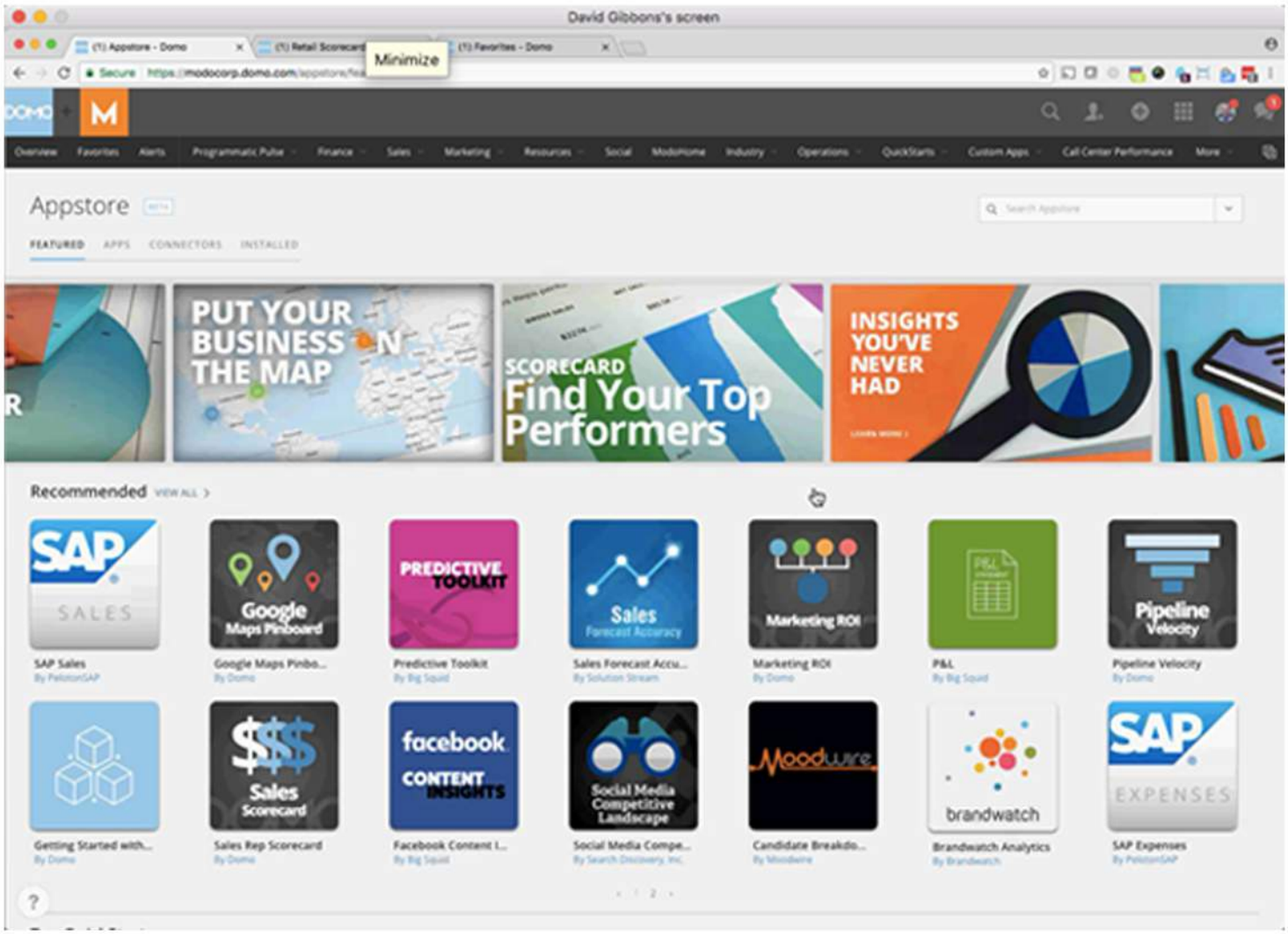
Not surprisingly, MAP vendors encourage such communities by offering Web development forums where developers can share ideas, troubleshoot problems, and recommend enhancements. Most also establish Web marketplaces where developers can share code and applications and, in some cases, sell their creations for a fee. (See figure 3.)

Figure 3. Vendor App Store



Domo, the sponsor of this report, runs a marketplace that contains more than 1,000 applications created by Domo and third-party developers.

The number of developers and applications available on a marketplace indicates the health and vitality of a MAP. For example, Apple, which pioneered the application marketplace when it launched the iPhone in 2008, now boasts more than 2 million apps in its App Store. Salesforce.com has more than 3,000 applications in its AppExchange and about 4 million installs to date.

Balancing Polarities

Perhaps the most important characteristic of a modern analytics platform, as mentioned earlier, is that it balances the polar forces that rip apart many BI programs, such as the conflict between speed and standards; agility and architecture; and governance and self-service.

It is difficult for BI programs to serve two masters, each with different strengths and weaknesses. BI programs typically embrace one master until they're repelled by its downsides, then they whipsaw to the other master and return back again in a perpetual negative reinforcing loop. A MAP (along with an enlightened, federated organization) enables organizations to enjoy the benefits of these dueling forces while minimizing their downsides.

Here are the key polarities that modern analytics platforms address and how they do it

1. **Silver Service versus Self-Service**
2. **Self-Service versus Governance**
3. **Enterprise versus Business Unit**
4. **Performance versus Scalability**

1 Silver Service versus Self-Service

Is a platform designed to serve casual business users or power users? Most BI tools (and BI programs) are designed to support one or the other; supporting both is difficult because they have polar opposite requirements. But a modern analytics platform recognizes these two worlds of BI and unifies them in a single platform.

Silver Service

Casual users use information to do their jobs; they are not hired for number- or data-crunching abilities. They generally want to consume reports and dashboards that make it quick and easy to monitor their performance against predefined metrics, analyze key trends and anomalies, collaborate with others around the data, and act on the findings. What they need is "silver service" BI—highly tailored and interactive reports and dashboards that deliver information and recommendations "on a silver platter."

There are two types of casual users: (1) *data consumers* who consume interactive reports and dashboards without modification, and (2) *data explorers* who customize predefined reports and dashboards by adding new metrics, dimensions, hierarchies, and data, which they can share with others (if permitted) or export to a desktop productivity tool (if allowed).

Gray Area. A MAP supports both types of casual users equally well, even though data explorers are notoriously difficult to manage because they fall into the gray area between silver service and self-service. To better serve data explorers, some MAP products provide a wizard-like approach with built-in rules and machine intelligence that makes it easy for business users to edit and design data sets and reports without significant data modeling, SQL, or design experience.

Self-Service

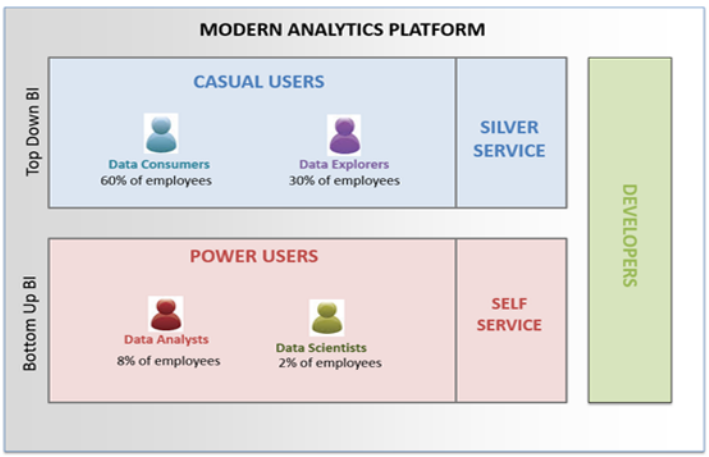
In contrast, power users are hired to gather, analyze, and visualize data to answer new and unexpected questions. Rather than use data to monitor operations, they use data to explore new opportunities, analyze root causes, and develop predictive models to improve operational efficiency or increase customer engagement and satisfaction. Although power users spend a lot of time creating custom reports and dashboards, many of which are consumed by casual users, they are more than just report developers—they are analysts hired to crunch data, answer unanticipated questions, and generate new insights about the business.

There are two types of power users: (1) *data analysts* who query various data sources, mash up the data, create custom metrics and comparisons, visualize the results, and share with others, and (2) *data scientists* who can import predictive models into the platform, embed them within queries and reports, and generate scores for each record to assist with decision making. A MAP supports both types of power users, although data scientists typically employ a separate data mining tool to create predictive models.

Blending Silver and Self-Service

A modern analytics platform provides both silver service and self-service capabilities: a silver service environment so casual users can monitor the business, and a self-service environment so power users can change it. It does this by offering a complete range of BI functionality integrated into a single, unified architecture. In short, it supports both "top-down" (i.e., IT-driven) and "bottom-up" (business-unit-driven) approaches to BI. (See figure 4.)

Figure 4. MAP Supports Multiple Types of Users



Top-Down BI. A MAP provides a full-featured design environment that enables IT and business developers to build highly tailored (and editable) reports and dashboards for all types of casual users. It also supports a customizable graphical user interface (GUI) and social-media-enhanced portal that displays relevant functionality and content to each user according to their role, group, and preferences. Finally, it also enables Web and application developers to build custom analytic applications using built-in

configuration settings or a robust API. For instance, a developer might create a custom sales application that prioritizes customers and prospects by their propensity to purchase products and assembles relevant data and information the salesperson needs to execute the call.

Bottom-Up BI. A MAP also provides a complete visual discovery and analytics environment geared to power users. A MAP contains a data catalog for finding new sources of data; a data preparation tool for blending and transforming data; and a visual discovery tool to visualize and share findings. In addition, the platform enables data scientists to embed predictive and prescriptive models they've created in R or other modeling tools into new or existing reports and dashboards. This brings the power of predictive analytics to all employees.

2 Self-Service versus Governance

As mentioned in the "Evolution" section above, companies that have experienced the downsides of self-service analytics now want to swing the pendulum back toward a more governed environment. There are certainly pros and cons with both self-service and governed approaches.

Self-Service

Self-service gives business users what they want, when they want it, how they want it. They no longer have to wait for the IT department

Pros. Self-service gives business users what they want, when they want it, how they want it. They no longer have to wait for the IT department to set up a data warehouse, model the data, and build the reports, which can take months or years. And they don't have to contact IT if they want to add or delete a column in a report or add new data from a new source. With a triumvirate of self-service tools (i.e., data catalog, data preparation, and visual discovery), they can largely do this work on their own.

Cons. The downside is that power users can flood the organization with dozens or hundreds of conflicting reports, dashboards, and data sets, creating confusion and distrust in the data. Most organizations have a plethora of renegade reporting units and power users who build reports and dashboards independently without consulting or working with other groups who may be using the same data and metrics and generating many of the same reports. Besides creating a Tower of Babel, self-service BI can be extremely costly, creating redundant systems and software and requiring people to manage them.

Governance

Pros. Governance means a lot of things: privacy, security, data consistency, metadata, data quality, data integration, compliance, data lifecycle management. At its heart, governance is about managing data in a systematic way to ensure the data is usable, trustworthy, and secure. This is a tall task that has traditionally

been centralized and managed by the corporate IT department, which has the right training and skills as well as support from the company's top executives who want a unified, standardized, and cost-effective approach to data management.

Cons. The downside to centralized governance is that it rarely works well or efficiently. In the BI space, corporate IT designs and builds data warehouses, data marts, and reports in a very systematic and careful manner and then locks them down, making changes difficult and time-consuming to execute. The result is that the business has to wait for data, sometimes for weeks or months, and they either learn to do without or find solutions themselves, creating renegade data and reporting environments that wreak havoc on data consistency, security, privacy, and so on.

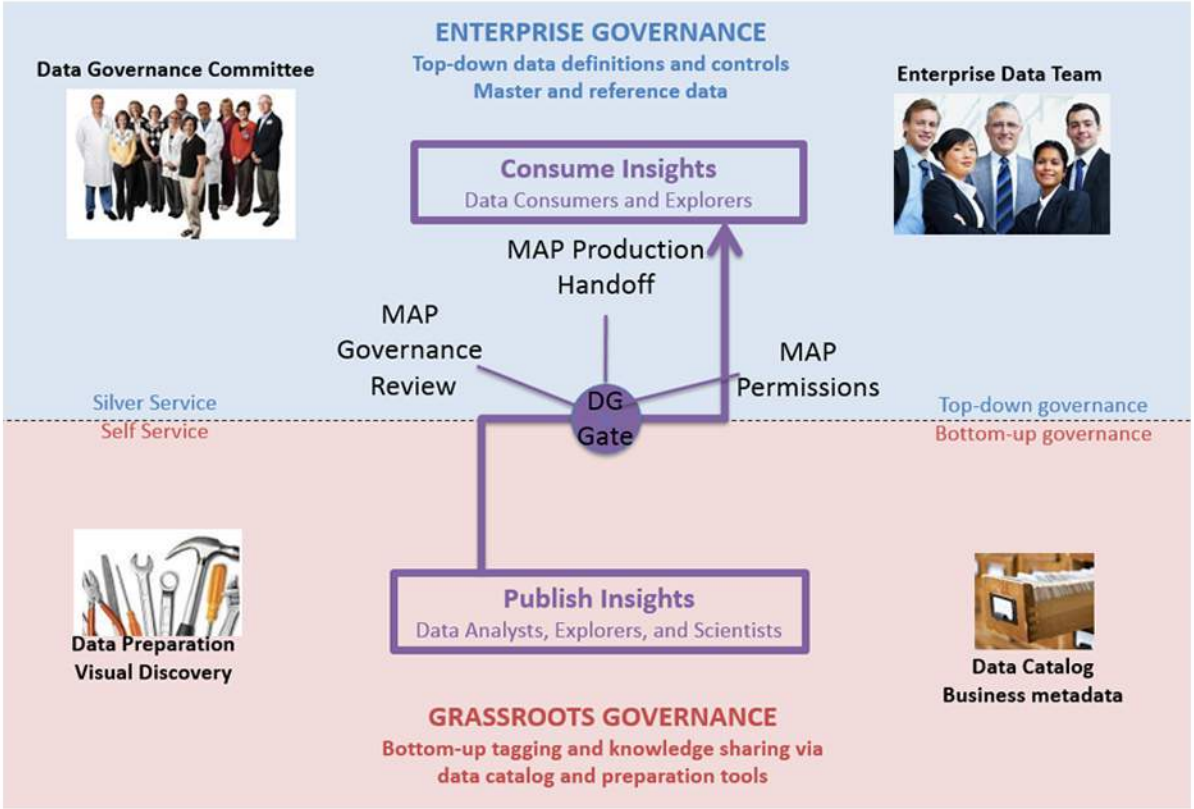
Governed Self-Service

A MAP brings together the disparate worlds of governance and self-service in a single environment. It establishes a "governed self-service" environment in multiple ways:

- **Common platform.** Because a MAP supports all types of users and modes of BI, it can serve as a single environment for all users. Having all users on a single, standard platform makes it easier to govern users and data without overly circumscribing their data freedom. The irony of self-service is that it requires standardization to work.

- **Grassroots governance tools.** The self-service world brings its own form of governance, which can be encoded in a data catalog that is continuously updated by power users as they search and use data sets and reports. By tagging content as they go, power users can establish meaning and knowledge about the data, which can facilitate the work of top-down governance groups. (See figure 5.)

Figure 5. MAP Blends Enterprise and Grassroots Governance



A data governance gateway (DG Gate), enabled by a MAP product, provides a bridge between top-down and bottom-up BI and enterprise and grassroots governance approaches.

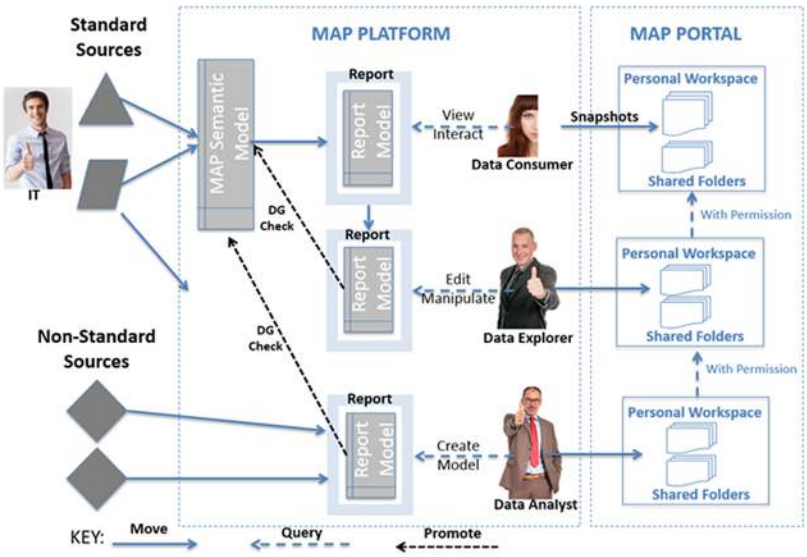
- **Granular permissions.** A MAP enables administrators to assign permissions so users and groups can access data and BI functionality based on their roles and needs, including, most importantly, the ability to edit or create reports and data sets, download them to a desktop, and share them with others.

- **Permission automation.** A MAP provides automation features that streamline user management and provisioning. These include single sign-on; automatic user profile creation; and scripting-controlled user permissions and access controls.

- **Production handoffs.** In some cases, a self-service report may need to be rewritten to conform to security, scalability, and design standards, or the data warehouse may need to be extended to support new data types and sources. A MAP allows designers to receive report "prototypes" from power users and then convert them into enterprise-caliber products. (See figures 5 and 7.)

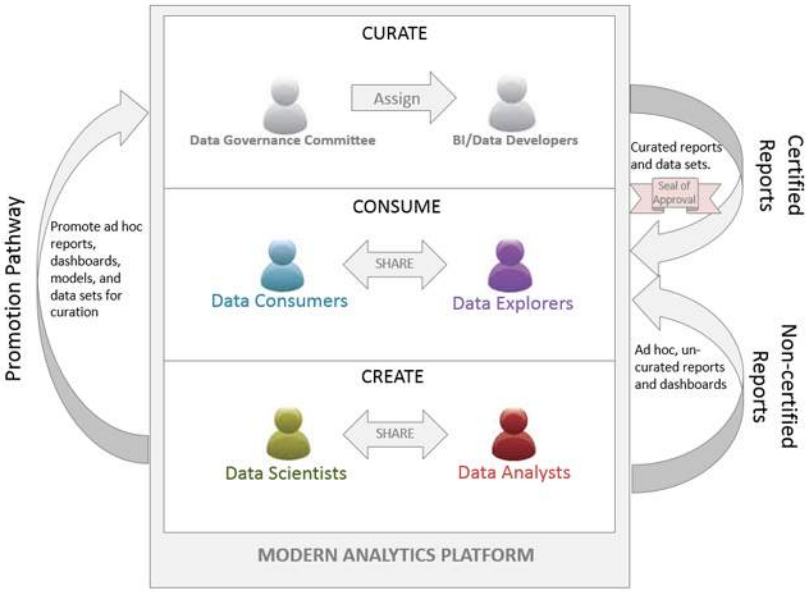
- **Virtual workspaces.** A MAP allows both casual and power users to create new or modified reports and data sets and save them in a virtual workspace that only they can access. This way, no uncertified data or reports get exposed to the wider community without permission. (See figure 6.)

Figure 6. Governed Self-Service Requires Granular Permissions and Virtual Workspaces



MAP permissions enable the most suitable self-service and sharing for each type of business user.

Figure 7. Certifying Reports and Data Sets



A MAP facilitates the process of promoting reports and data sets for certification.

- **Promotion and publishing processes.** Although people (i.e., data stewards) are required to certify that new or modified reports and data sets conform to established standards, MAP products can accelerate the process by providing a promotion pathway that lets power users submit content for review by a data owner, steward, or governance committee and earn a certification stamp and license to publish the report to the enterprise. (See figure 7.)

- **Internal app stores.** In the near future, MAP products will host internal app stores that make it easy for business users to find certified reports and content. The stores will enable business users to explore both certified and uncertified content using search, filters, automated recommendations, role-based links, and various types of social media cues and techniques. MAP products solve the "last mile" of BI by connecting users to relevant reports and maximizing adoption.

3 Enterprise versus Business Unit

The two polarities just discussed address much of the conflict between enterprise and business unit approaches to BI and analytics. In essence, the enterprise (or corporate) prefers top-down, centralized BI because it purports to provide data consistency and economies of scale. Business units, on the other hand, prefer bottom-up BI because it's more agile, customizable, and relevant to their needs.

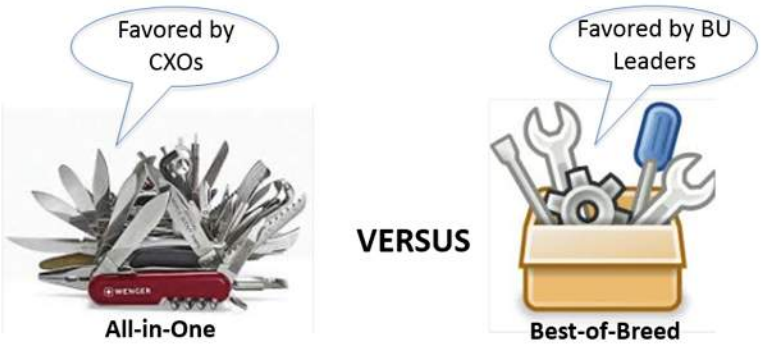
All-in-One versus Best-of-Breed

One facet of this polarity that we haven't yet discussed is tool standards, which present a thorny problem for all BI leaders. The discussion usually pits those who prefer an all-in-one tool against those who prefer best-of-breed. A MAP clearly falls into the all-in-one camp, although in practice, it can be deployed as a best-of-breed tool.

All-in-One. The enterprise, led by top executives, prefers a single BI platform for all users. One tool from a single vendor streamlines the purchasing process, delivers economies of scale, facilitates a close supplier relationship, improves data and report consistency, and reduces training and integration costs.

Best-of-Breed. On the other hand, business units find a single tool or platform limiting. They prefer a best-of-breed strategy that allows them to use the tool that best meets their local requirements rather than one foisted on them by a corporate parent, which wants to meet everyone's needs with a lowest-common-denominator tool set. (See figure 8)

Figure 8. All-in-One versus Best-of-Breed



Pros
- Software standardization
- Supplier simplification
- Volume discounts
- Data and report consistency

Cons
- Not always best of breed
- Vendor lock-in
- Migration costs

Pros
- Optimal functionality
- Higher user productivity
- Vendor leverage

Cons
- Higher license costs
- Higher support costs
- Data bound by tools/GUI
- Integration between tools

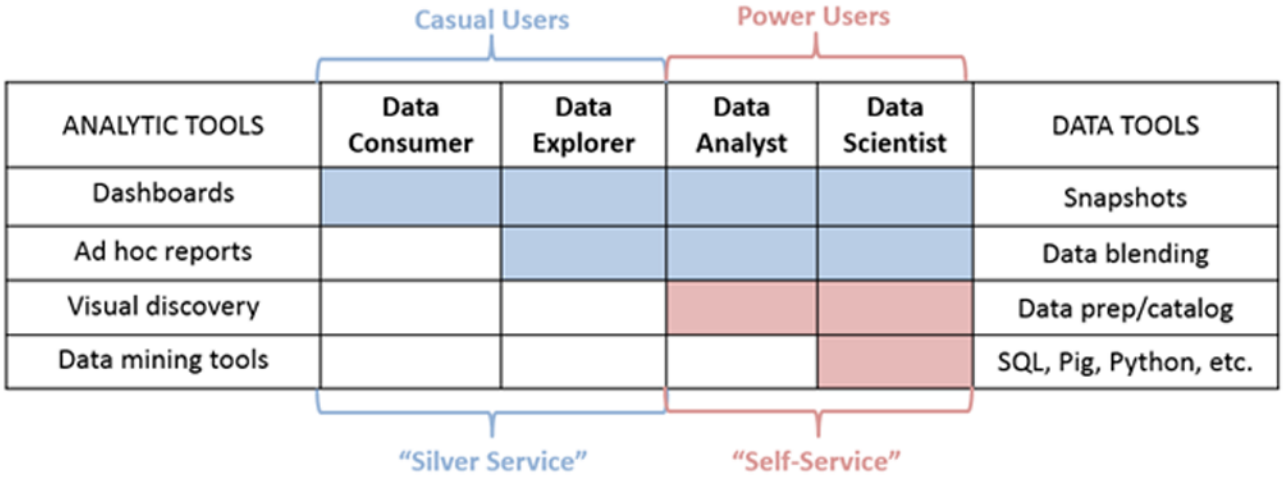
Creating Standards

Today, advocates of the best-of-breed strategy have the upper hand. In most organizations, business unit leaders now have the autonomy and budget to purchase their own tools and hire their own people to deliver data and insights. Corporate executives and BI leaders are losing the tool standardization battle. Most now realize that standardizing on tools is not the right argument to have with business units. Most are focusing on data models and semantics shared across business units as the place to wage a standardization battle.

The land-and-expand approach, where the internal market selects the winning products, is a common way that organizations establish a BI tools standard today.

That being said, a MAP might still be an appropriate choice even in a best-of-breed shop. Most MAP products can be purchased to support either an entire business unit or one component in a BI portfolio. (See figure 9.) Over time, people will recognize the value of a good MAP product and begin to deploy it in more places throughout the organization. This land-and-expand approach, where the internal market selects the winner, is a common way that organizations establish a BI tools standard today. A de facto standard is better than a de jure standard that no one implements.

Figure 9. BI Tools Matrix



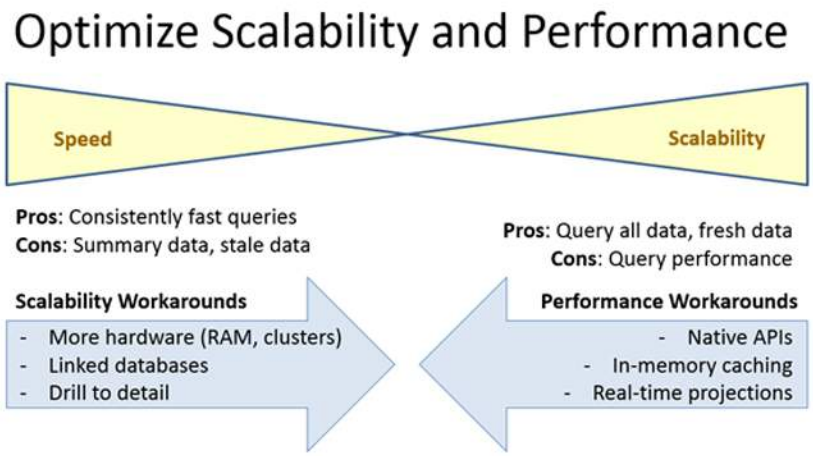
It's best to create tool standards for each type of user. A MAP product will support all four types of users equally well, although data scientists typically have a dedicated data mining tool for creating models.

Competitive Marketplace. Maybe the best way to implement standards in the modern era is not through top-down mandates, but through a bottom-up marketplace in which a variety of products compete to deliver the most business value. The winning product also wins the standards battle. The only caveat here is that some products shine in a departmental environment but fail miserably when deployed on an enterprise basis, which requires industrial-strength administration, security, and manageability. A good MAP product provides enterprise-caliber functionality.

Maybe the best way to implement standards in the modern era is not through top-down mandates, but through a bottom-up marketplace in which a variety of products compete to deliver the most business value.

4 Scalability versus Performance

Figure 10. Trade-Offs and Workarounds

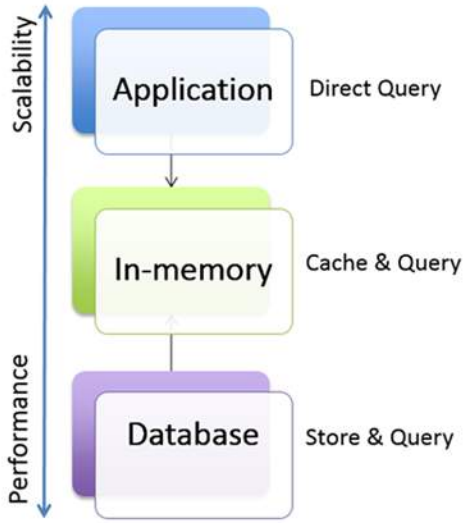


One perpetual technical conflict is between scalability and performance. Some tools query all the data, giving users the most up-to-date and comprehensive information. But these tools are often slow, especially when querying large volumes (i.e., terabytes to petabytes) of data. On the other hand, some tools provide fast query performance, supporting iterative analysis and decision making, but they often run against a subset of data that someone has to capture, model, and store in a local high-performance database in advance. (See figure 10.)

Traditionally, BI tools have opted for either scalability or performance and created workarounds to minimize the downsides of their approach.

Traditionally, BI tools have opted for either scalability or performance and created workarounds to minimize the downsides of their approach. A MAP also supports numerous types of workarounds, but many now also have a multi-faceted data architecture that can be tailored to optimize a workload or application. (See figure 11.)

Figure 11. Multi-Tiered Data Architecture



When users want all the data or the freshest data (i.e., scalability), they query the source systems and applications directly. This approach is often used to support operational dashboards that require fresh data from multiple systems. When users want to iteratively analyze the data, they download a subset of data to an in-memory cache or database. The in-memory cache provides the fastest queries once the data is loaded, while the standard database provides a persistent store for the cache, eliminating the round trip to the source system once the cache is flushed, thereby delivering more consistent query performance.

A MAP might be known by its features and functions, but its real strength is its ability to resolve the conflicting polarities that, if not properly balanced, can cause a BI tool or BI program to fail.

MAP Characteristics

This report has explained the key characteristics and design principles of a MAP. Along the way, it has mentioned a number of features and functions that a MAP supports. This section lists the key features and functions that every MAP should support.

- **All modes of BI.** This ranges from reporting, dashboarding, scorecarding, and Excel integration to OLAP, ad hoc reporting, alerting, search, visual discovery, and data science integration.
- **Comprehensive charting.** This supports a comprehensive set of visualizations, including custom geographical mapping, and the ability to integrate third-party visualizations into the platform or create unique ones.
- **BI portal.** A role-based and personalizable home page where users can easily find BI content relevant to them.
- **Search.** Users can not only search for content, but also launch queries through natural language searches.
- **Collaboration.** Built-in support for annotations, threaded discussions, and the ability to follow, like, and search for data-driven colleagues.
- **Business metadata.** Business users can query an object to investigate its metadata, including source, lineage, owner, and description.
- **Data connectors.** Supports a vast array of custom connectors to both cloud and on-premises data sources and applications.
- **Data capture and storage.** The ability to capture, transform, clean, and integrate data and store it in a local high-speed repository designed for query processing.
- **Data catalog.** This scans corporate databases and creates a de facto catalog of data elements that power users can search and annotate, making it easier to create and manage relevant data sets.
- **Data preparation.** Lets power users select, clean, transform, and merge data to create custom data sets for analysis purposes.
- **Storytelling.** Lets users assemble charts and tables into a live (or static), interactive, sequential flow of insights without exporting to PowerPoint.

- **Automated recommendations.** Using built-in heuristics and algorithms, MAP tools recommend actions or automate tasks, such as selecting an appropriate chart for displaying data, linking disparate tables, defining data types, generating suggestions for related reports, and automatically generating reports or dashboards based on a data set.

- **Data federation.** Queries multiple data sources simultaneously and joins the results for display in a chart or report.

- **Data design and modeling.** Allows business developers and power users to create business-friendly data models to build custom reports and applications.

- **Custom groups and analytics.** Allows business users to create new metrics, user groups, date ranges, hierarchies, and other groupings to facilitate custom analyses.

- **Centralized metadata.** Stores all objects required to run reports and dashboards (e.g., data elements, filters, prompts, metrics, templates, charts, connectors, layouts, and reports) in a central catalog. Changes are instantly propagated to all downstream applications. Supports data lineage and impact analysis.

- **Central administration.** Allows administrators to install, monitor, and manage the MAP; manage user accounts and permissions; view and track product usage; compare report versions; and manage the development lifecycle (i.e., design, test, and production).

- **Natural language generation.** Soon we'll see artificial intelligence built into BI tools to automatically distill the key findings of existing reports and dashboards and either write or speak the findings in plain English.

Conclusion: What MAP Is Not

Throughout this report, we've discussed the key characteristics, design principles, and features of a MAP. After reading this far, you might think that a MAP is simply a superset of all the features ever delivered by a BI vendor. And you might be right! A MAP is feature-rich and designed to be all things to all people—casual users, power users, developers, IT administrators, and data designers. It's something that a Johnny-come-lately BI vendor cannot deliver.

Irony of MAP. The irony is that it takes years of experience and development to create a MAP, yet a MAP must be built on the latest technologies with the most modern platform. Thus, a lot of MAP products are either startups run by seasoned BI veterans or older products that have been completely reengineered for the modern era.

NOT! So, to conclude this report, perhaps the best way to describe a MAP is to define what it is not.

From the evolution section of this report, you know that a MAP is:

- Not a purpose-built BI tool (i.e., just reporting or just analysis)
- Not a suite of non-integrated or lightly integrated BI tools
- Not a self-service visualization tool with data preparation functionality

You also know from the design characteristics section of this report that a MAP

- Doesn't require a desktop tool
- Doesn't just run on on-premises servers
- Doesn't require authors to create separate mobile applications
- Doesn't just serve internal employees
- Isn't a closed platform that can't be queried or accessed via a rich API

Finally, you know from our polarities section that a MAP is:

- Not just an IT-driven platform
- Not just a self-service platform
- Not just for big data or fast data
- Not just for casual users or just for power users or developers
- Not just for the enterprise or just for business units
- Not just an all-in-one tool or a best-of-breed tool

In the end, a MAP is designed to support all BI use cases and users using the latest and most modern technologies and approaches while balancing the dual and dueling polarities of:

- Casual users and power users
- Self-service and governance
- Enterprise and business units
- Performance and scalability

It's hard to imagine the next step beyond a modern analytics platform, but MAP vendors will certainly figure it out. And given the flexibility of their current one-stop-shopping platforms, they will be able to build in needed capabilities quickly to stay on the leading edge.