



How to Reduce TCO and Increase the ROI of Business Intelligence and Analytics

By David Stodder, Senior Director of TDWI Research, Business Intelligence

Businesses are under pressure to respond rapidly to changing market conditions. The need for quick action can lead to poor decision making without consistent data analysis. Successful organizations utilize business intelligence (BI) and analytics technologies to enable executives, managers, and frontline personnel to visualize performance metrics clearly so they can quickly identify how to streamline service offerings, improve operational efficiency, and react to consumer feedback. BI and analytics technologies can even drive innovation by enabling users to follow data trends and discover opportunities for new products and services.

Organizations need BI and advanced data analytics now more than ever. TDWI research has uncovered strong interest in expanding BI and analytics capabilities in organizations that are ready to move users beyond spreadsheets and adopt advanced data technologies and services for the first time. However, along with the desire to propel their businesses forward come fears about rising total cost of ownership (TCO). TDWI frequently sees in its research that TCO concerns are among the leading reasons why organizations limit BI and data analytics capabilities to a small group of users.

Users want self-service capabilities so they can avoid having IT and development teams involved in coding simple changes to their dashboards and visualizations. However, organizations frequently confront escalating per-user licensing fees when they democratize BI and analytics and expand self-service capabilities. Per-user licensing plans are

often not linear; the addition of a single user can increase overall costs dramatically if the addition elevates the plan to the next licensing tier. Similar jumps in TCO can occur when organizations increase data volumes, processing activity, and concurrent user access. When this happens, many organizations will halt plans for BI and analytics expansion and hold off on giving users greater self-service independence.

Third-party developers are also concerned about TCO. They see demand rising among clients for data-rich analytics and visualizations embedded inside business applications and services.

Embedding BI and analytics can create a major competitive differentiator. Here are just two examples:

- **Retail.** Decision makers want to use data to analyze store layouts and customer experiences so they can make timely adjustments that increase revenues. Embedded BI and analytics in applications and services could enable them to reduce time to insight and develop the right strategy. Embedded solutions can deliver integrated data views and improve analysis of industry-specific variables as well as data sourced from multiple channels.
- **Financial management.** Executives and managers need to understand market volatility, track revenue trends, determine pricing strategies, and use predictive insights to sharpen forecasting. Financial management applications with embedded in-context, personalized dashboards and analytics modeling capabilities make it easier to accomplish these objectives.



With traditional technologies and licensing, developers have had to weigh the benefits of adding embedded capabilities against TCO increases that reduce margins.

LOOKING TO THE CLOUD FOR TCO RELIEF

Many organizations are turning to cloud computing as a remedy for rising TCO. TDWI research finds strong interest in augmenting or replacing existing on-premises systems with pay-as-you-go subscriptions to software- and platform-as-a-service (SaaS and PaaS) systems. More than half of organizations surveyed (54 percent) currently have enterprise BI, reporting, and dashboards running in the cloud and nearly as many (51 percent) have business-driven self-service BI and analytics there.¹ Digital transformation of business applications and processes is generating new volumes of data that organizations are storing in the cloud, adding to the cloud's "data gravity."

For many organizations, cloud data gravity is pulling BI, analytics, data integration, and data management systems into the cloud to be closer to the data. However, TDWI research finds that simply migrating these systems to the cloud does not reduce TCO. More than half of organizations (57 percent) surveyed cite managing costs as their most serious challenge in augmenting or replacing existing on-premises BI, analytics, data integration, and data management systems with cloud-based platforms and services. Organizations experience sticker shock due to unforeseen processing, networking, and data management expenses generated by the need to support high numbers of concurrent, remote users who want frequent access to volumes of data over networks.

To maintain TCO levels, some organizations will instruct IT to limit how much users can interact with cloud data. For example, TCO concerns might discourage an organization from letting its sales and contact center managers, data scientists,

and analysts access the volume and variety of data they need to gain predictive insights into customer trends across regions. These insights might offer a competitive advantage if they led to timely recommendations of the most relevant cross-sell and up-sell offers to make to customers. Instead, managers are stuck with canned reports and limited data, reducing the value of data visualization and analytics.

Web-based solutions can address costly silo complexity. A major driver of higher TCO is the growth in data silos for BI and analytics workloads, which are proliferating in the cloud just as they have in on-premises environments. Many organizations move into the cloud in a piecemeal fashion. Business units will set up individual BI and analytics applications and supporting data marts for their projects; data scientists will create a data lake on a different cloud storage platform to explore new data, test predictive models, and develop artificial intelligence and machine learning (AI/ML) algorithms.

The resulting application and data silos increase TCO because of management complexity, duplicate data, overlapping tool functionality, and higher licensing costs. With so many silos, organizations also experience an increase in development costs because they need specialized data integration tools and custom programs to connect to data sources.

Web-based BI and analytics solutions can provide an alternative that enables organizations to have more control over costs and reduce duplication and technology overlaps. Web-based solutions offer users access to full-featured applications through a browser. The applications and data platform may be located on-premises or in a private cloud. Rather than manage each user's application individually, organizations can centralize management of data availability, scalability, governance, and security behind the firewall.

¹ 2020 TDWI Best Practices Report: *Evolving from Traditional Business Intelligence to Modern Business Analytics*, online at <https://tdwi.org/bpreports>.



From their desktop computers, mobile devices, or via large-format displays in shared workspaces, users can interact transparently with the data using personalized dashboards and other visualizations, including those embedded in applications and services.

With these broad trends in mind, we can look more closely at TCO factors. This TDWI Insight Accelerator will focus on how organizations can reduce TCO without negatively impacting the business benefits they seek through expansion of BI and analytics.

DEFINING TCO AND ALIGNING WITH ROI

Organizations need to calculate TCO in the context of return on investment (ROI)—the projected business net value that justifies the cost of ownership. However, the ROI of BI and analytics systems is often difficult to calculate because their true contributions are downstream in the business outcomes of data-driven decisions and actions.

For example, data insights presented in a dashboard might improve a sales manager's sales funnel forecasting, which then informs field-level decisions that lead to higher sales. Analytics could show field sales managers where they can reduce expenses otherwise incurred chasing what the data shows to be unprofitable leads. Yet, if the link between the direct costs associated with BI and analytics and improved business outcomes is not clear and documented, the relationship between TCO and ROI can be misunderstood.

ROI metrics improve visibility into TCO. To improve alignment between TCO and ROI, organizations should set up metrics that clarify the value of BI and analytics investments in achieving desired business outcomes. The visibility provided by such metrics can clarify plans to reduce TCO by enabling decision makers to see how changes affect specific projects and users and to find costly but underutilized data assets, dashboards,

or data transformation routines. The metrics help organizations see whether a TCO increase might be attributable to changes in BI and analytics workloads driven by new user requirements caused by a shift in business strategy. With these metrics, decision makers could develop informed insights into whether business outcomes justify TCO increases.

The starting point for many TCO calculations is to account for factors common to most applications or services:

- Purchase, licensing, and/or subscription costs
- Cost per user and per IT staff member (e.g., data engineers and administrators)
- Hardware, network, and other IT infrastructure costs
- User and developer training costs

Organizations migrating to cloud-based applications and systems will shift much of their focus to service subscription terms and what the organization receives for the services. However, TCO calculations for cloud-based services need to go beyond just subscription terms to include factors such as how changes in concurrent user access, availability requirements, and workload demands for more CPU time and processing power affect TCO. Additionally, intensive use of cloud services will likely trigger related costs to the organization, such as the need for more network bandwidth and increased data engineering, IT administration, development, and training.

SIX FACTORS THAT IMPACT TCO AND ROI

Beyond the above fundamental TCO factors, organizations need to consider some important but less easily accounted-for factors. Focusing on the following six issues will help organizations improve alignment between TCO and ROI for BI and analytics.



Speed to insight. One of the biggest drivers behind investing in BI, analytics, and supporting data integration and management is to accelerate speed to insight. Business opportunities are lost if executives, managers, and frontline workers don't have timely data and analytics. However, TDWI research finds many users continue to be frustrated with how long they must wait for IT to ingest, collect, transform, and prepare usable data. They are also impatient with development cycles for producing reports, data visualizations such as dashboards, and nuggets of analytics insight relevant to their concerns.

The quest for faster insight is often why users want self-service tools and services. They want more control and to avoid having to wait for IT developers to write queries, develop models, and create visualizations. However, organizations need to evaluate the entire data life cycle to determine whether provisioning self-service tools will be enough to produce speed to insight. They should observe the complete user experience, including how long it takes to select and access data sets, submit a new query, get results back, and present them in a report or dashboard.

TDWI research: Just 21 percent of organizations surveyed say users are very satisfied with query performance critical to speed to insight. About half (51 percent) are looking for technologies or services that provide some improvement and 19 percent feel they need a major upgrade.²

Organizations can develop metrics based on observing the user experience, the development and preparation time required for projects, and query performance to determine whether self-service BI and analytics solutions are delivering faster time to insight and therefore justifying TCO. To address problems that slow insight and increase costs, organizations should consider delivering functionality through centralized

enterprise BI and analytics. Centralized systems can reduce the redundancy and inefficiency that often proliferate with individual, siloed self-service solutions and services.

Scalability and concurrency. Organizations that are too focused on the license or subscription costs may not evaluate closely what will happen when they later want to add users and data and launch more ambitious and complex analytics workloads. For example, an organization that chooses a BI software or service solution that initially offers low TCO for 50 or fewer users might find the licensing becomes more costly when the organization wants to expand to more users. The solutions could also hit scalability and concurrency limits that become serious problems in terms of delivering ROI.

Organizations need to invest in solutions and services that can keep pace with the growth of BI and analytics. Solutions must support growing projects that involve interaction with bigger data volumes or adding perhaps hundreds of additional nontechnical business users.

Third-party developers and organizations that are monetizing data and analytics through developing services should also evaluate the impact on licensing and subscription fees of adding users and workloads. They should examine what happens when more processing-intensive visualizations and analytics are embedded in applications and services. In proof-of-concept and testing phases, organizations should evaluate how TCO is affected by demands to increase scalability and concurrency.

BI centralization. As noted, piecemeal growth in the cloud and uncontrolled, decentralized self-service BI and analytics can drive higher TCO because these factors typically bring greater inefficiency, redundancy, and problems with data quality and consistency. Governance is also difficult in a decentralized data and analytics

² Ibid.



environment; organizations struggle to enforce rules and policies for acceptable data use across silos. Organizations should evaluate whether they can overcome these issues by instituting a centralized BI and analytics platform that provides users with web-based access through a browser. Organizations can monitor adherence to governance rules and security access controls centrally on this platform, reducing costs and complexity.

Deploying a centralized BI platform can make it easier to provide users with a single view of the truth, i.e., access to all relevant data through a single dashboard or report. TDWI research finds this is one of the most important ROI benefits organizations seek from BI applications and their underlying data integration and data warehouse systems. A single view of the truth can be elusive if not impossible to achieve with disparate, siloed systems. The pursuit of a single view can also be costly; heavy data movement and replication between disparate applications and data platforms to bring the data together can drive up TCO. BI and data centralization can help organizations reduce TCO by alleviating the need for extensive data movement.

Access to live or real-time data. Particularly for operational use cases, data rises in value the closer users get to real-time access. Operational personnel must often make quick tactical decisions; they need near or true real-time data feeds in mobile devices, large-screen displays, and notifications embedded in applications and desktops. Advanced BI platforms that can deliver real-time data feeds and analytics alongside historical data can provide more complete views of performance metrics. With this data, often through dashboards, business managers can see current trends that impact real-time decisions involving customer and partner engagements. Frontline managers and users can use timely data for situation awareness, enabling them to adjust logistics, resource allocation, and supply chains.

TDWI research: A significant percentage of organizations surveyed (39 percent) say they need a major upgrade to their systems and solutions to support workloads that need access to live or real-time data; 37 percent are looking for at least some improvement beyond what they have.³

Organizations should evaluate the ROI they could gain from closing data latency gaps and enabling more users and analytics workloads to access live or real-time data. If justified by ROI, TCO calculations should account for the level of concurrent user access workloads will require. Organizations should look for technologies that can maintain or lower TCO as they broaden business user access to live or real-time data.

BI flexibility for business agility. Actionable data insights and timely analytics are essential to modern business agility. Otherwise, organizations are blind to changes in their markets, customer preferences, supply chains, and the dynamic business climate. User demands for data and analytics will not remain static as organizations democratize BI and analytics to expand data-driven decision making. Organizations need to look for BI platforms that enable user flexibility to explore different data sources, personalize data visualization, and develop analytics.

TDWI research: A significant number of organizations surveyed by TDWI (40 percent) are looking for improvement in BI and analytics to increase flexibility for different types of workloads. About one-quarter (26 percent) are seeking a major upgrade.⁴

Concerns about IT costs often prevent organizations from addressing user demands for greater flexibility. This can ultimately limit business agility; users are stuck with canned reports and limited functionality. Fortunately, technology advances such as web-based and

³ Ibid.

⁴ Ibid.



cloud-based systems fronted by intuitive graphical user interfaces can make it easier for organizations to enhance BI and analytics functionality without driving up costs.

If centralized management of BI and analytics applications and services fits the organization's objectives, this strategy can help increase agility while controlling costs. Organizations can address different types of users and workloads centrally rather than having to upgrade each BI application instance, which can escalate IT costs and increase user dissatisfaction. From a TCO perspective, organizations can support a centralization strategy through server-based licensing, which makes it easier to maintain consistent costs as they scale up in users, data, and number of load-balancing servers. The organization can grow to meet flexibility needs without increasing user fees and hitting data size limits.

Data quality and improving trust. Data quality is always critical, but it becomes more so as organizations democratize BI and analytics. Data quality is vital to ROI; without trust in data quality, business users are hesitant to act on data insights. Poor data quality can increase TCO by becoming a hidden factor in slowing data preparation for visualizations and analytics. It causes errors that require rework and rerunning of queries and data transformation routines, making it harder to complete workloads on time and deliver ROI.

TDWI research: Two-thirds of organizations surveyed (66 percent) regard improving data quality as critical to the success of their BI and analytics. The same percentage of individuals see making improvements as their biggest ongoing challenge.⁵

To ensure investments in BI and analytics deliver benefits, organizations should articulate the need for data quality accountability among users as they

source data and massage it for visualizations and analytics. Organizations should make good use of BI semantic layers and data catalogs for identifying and remedying data inconsistencies, monitoring the quality of new data, and making users aware of the quality of the data sets they have selected.

HOW MULTITENANCY CAN REDUCE TCO

To grow BI and analytics for more users and workloads, organizations need a software architecture that can support scalability, flexibility, and fast deployment without increasing TCO. Many organizations have adopted cloud computing in a decentralized fashion and are experiencing the downsides of having too many disparate instances of single-tenant SaaS solutions. Although architectures can vary, with single tenancy, each tenant (or customer) software instance, database, security, and backup is physically isolated from those of others. Each tenant has sole access to, control of, and responsibility for the customization and updating of their instance.

This isolation may be necessary for organizations that want highly protected private cloud systems because by definition they promise full protection from any breach of data security, data loss, or performance issues other tenants might experience. However, scaling each single-instance system's management, updating, and optimization can be difficult and require significant IT involvement. Issues such as having enough memory, processing overhead, and additional hardware for each instance become hidden drivers of increased TCO as well as IT headaches.

Cost-effective expansion with shared multitenancy. A preferred approach for many organizations and third-party developers is to manage BI and analytics centrally in a multitenant architecture (see Figure 1). In this mode, a single shared application, database, and operating environment serves multiple tenants (or customers).

⁵ Ibid.

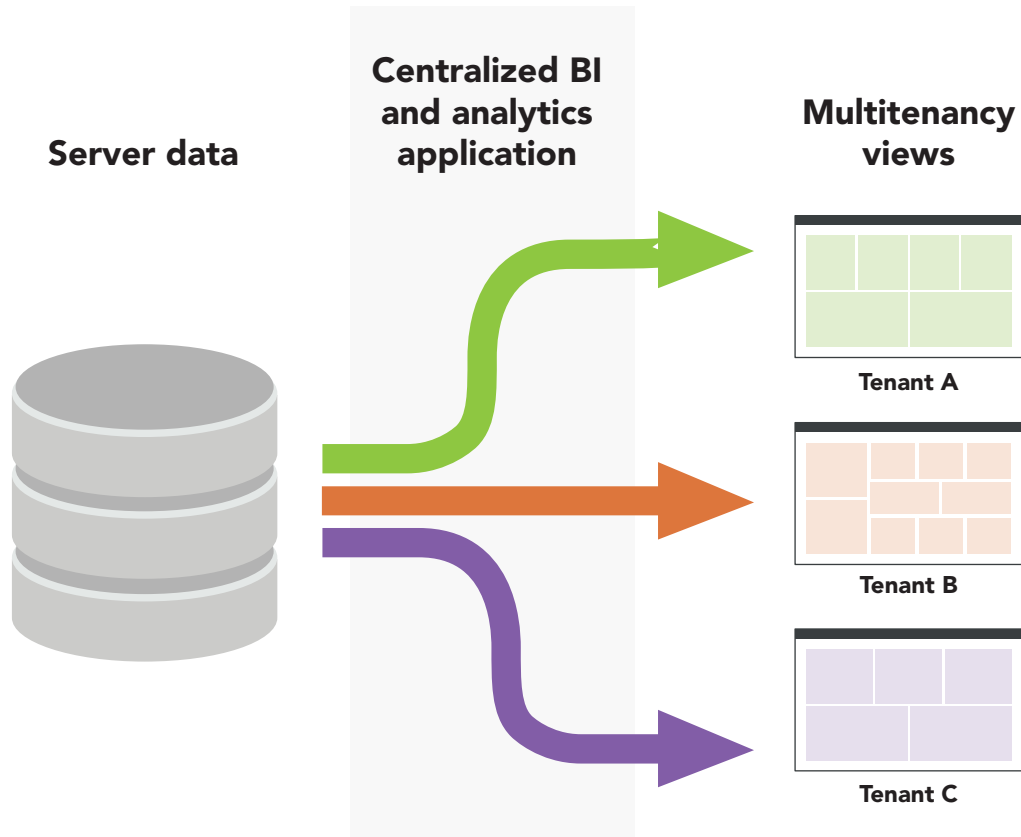


Figure 1. Multitenant architecture for BI and analytics.

Each tenant typically has a dedicated share of the instance that includes the data and application functionality. Instances are logically isolated but integrated from a physical application and data management perspective, which makes them easier and more cost-effective to scale and optimize.

A “tenant” in a multitenant architecture can consist of a group of users with common access to specific functionality and data interaction privileges. Web- and browser-based access enables tenant groups to include remotely located members of teams, divisions, departments, or geographic regions. A BI and analytics application using a multitenant architecture can enable each tenant group to define which users have access to which dashboards, reports, and data.

Multitenant architectures are flexible. Some implement “complete multitenant” models in which everything is commonly shared among

all tenants; others offer variations that provide greater isolation between tenants up to the levels of single-tenant architectures. Some may share the application layer among tenants but have fuller separation at the database level; others do the opposite.

How organizations or third-party developers charge each tenant can therefore vary as well. Organizations should compare different vendors’ fee arrangements, including whether per-user fees exist that may limit the affordability of functionality they may want to provide to all tenants.

Multitenancy benefits for BI and analytics.

Multitenancy can offer a better approach when organizations intend BI and analytics applications and workloads to deliver business value to multiple users and departments across an enterprise. Multitenant architectures can facilitate large-scale



testing of analytics models and applications that need access to data sets drawn from multiple cloud or on-premises storage locations. The architecture makes sharing and reuse of models, visualizations, data sets, and queries easier, which reduces costly duplication and redundancy and increases speed and efficiency. If it fits their strategy, organizations should consider lowering TCO by consolidating single-tenant instances into one multitenant BI and analytics environment.

Other important TCO and ROI benefits of multitenancy include:

- **Centralized maintenance and updating of functionality and personalization.**

These issues can be addressed centrally rather than by having to update each single instance. Collecting data into a multitenant environment's central database using a single database schema reduces the complexity of having to prepare, access, and query data across multiple sources. Organizations can provide significant personalization and look-and-feel flexibility to users through the multitenant views shown in Figure 1.

However, the centralized application can encourage reuse and ease collaboration, resulting in fewer development delays and TCO increases. The centralized environment can serve as a base for developers of embedded BI and analytics to expand services to different tenants and regions and provide easier and more economical maintenance.

- **Access control, security, and governance.**

Organizations can set governance rules and policies and monitor data use centrally but have the flexibility to set up rules that isolate tenant-specific data for governance, privacy, and security. In this way, multitenant systems can ensure a data breach in one workload does not impact others. Access and views can be restricted; access controls can be aligned with directory protocols such as LDAP, user

profiles, authentication procedures, and role-based security. Solutions in the market enable organizations to enforce security by limiting user access appropriately to reports, charts, dashboards, functions, data columns, or rows.

- **User and workload scalability.** With a multitenant architecture, organizations can onboard new tenants in a planned fashion that does not disrupt other tenants. Organizations can scale out servers for dynamic workload needs. In contrast, individual business groups or project teams implementing single-tenant SaaS solutions frequently confront cost or technology issues that make it difficult to scale to meet immediate business needs.

CLOSING RECOMMENDATIONS

This TDWI Insight Accelerator has discussed both specific and less easily calculated, often hidden factors that are important to reducing TCO while increasing ROI. We close with five recommendations based on TDWI research into factors that have the biggest impact on the ability to build ROI and to rein in TCO.

Ensure user flexibility and scalability with embedded BI and analytics.

Data-rich business applications with embedded functionality can be game-changing. Application users can visualize critical data and gain insights in context, closer to the point of action. Technology trends are enabling organizations and third-party developers to manage and reduce TCO without compromising value. Evaluate centralized BI and analytics, including solutions based on a multitenant architecture to gain the advantages of shared resources and support user personalization and flexibility.

Improve project planning and timelines.

Poor planning can have a big impact on TCO and ROI. As part of defining ROI and managing TCO, make sure you create and share timelines



that show key milestones and dates for on-budget project completion. Centralized BI and analytics can enable organizations to monitor data use and gain an end-to-end view of data life cycles, which can offer important feedback for updates and enhancements. It also helps organizations spot inefficiencies to correct. Teams can use ongoing planning meetings to monitor TCO and discuss the impact of changes to initial requirements and planned deliverables.

Increase user satisfaction.

ROI will be disappointing if users are not gaining full value from investments in BI, analytics, and supporting data integration and management. Even as self-service capabilities have matured, TDWI research finds most users want even greater ease of use, more dashboard personalization, and faster and easier query development. Organizations should not settle for the status quo if user satisfaction is not improving. Evaluate how well solutions support advancements that will increase user satisfaction and time to insight.

Establish good governance and data quality.

There is a clear relationship between data trust, reducing TCO, and realizing ROI. Organizations need to ensure they have modern tools and practices for improving data quality. Data quality and governance go together for improving users' trust in the data. Organizations should evaluate how a centralized, multitenant data architecture can enable more effective management of governance and data quality.

Increase scalability and resource optimization with multitenancy.

Many organizations are concerned that expanding self-service capabilities and enabling more data-rich analytics will lead to uncontrolled TCO. Having centralized applications and databases in a multitenant architecture can give organizations more control over costs as they democratize BI and analytics. With a centralized, multitenant

architecture, organizations can gain the benefits of optimized, load-balancing servers for scalability as they increase data, users, and analytics workloads.



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