An IIIE White Paper™

Tableau Total Cost of Ownership

A Study of Modern Business Intelligence Implementations in the Real World

August 2017

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Published by:
International Institute of IT Economics
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Executive Summary

The International Institute of IT Economics (IIIE) performed a study to assess the total cost of ownership (TCO) of modern Business Intelligence (BI) tools in use for data access and exploration at seven large corporations. Modern BI is a technology that enables self-service access, visualization, and sharing of data.

Data analysis and exploration is the application of BI tools to find answers to questions from data and then build and share interactive data-based content in charts, views, dashboards, and stories to provide insights into business challenges and opportunities.

The study was performed through a comprehensive survey and a round of interviews with IT and business users, which included questions about the use of Tableau being compared to organizations' legacy and / or competitive BI technologies.

Key findings:

- Organizations seek four primary business benefits that drive their deployments: faster time to market (for internal initiatives), making faster or better decisions, encouraging an analytic culture, and finding unique insights.
- The top TCO drivers in developing modern BI are labor, end user training and learning, hardware and software, and IT data management and support.
- Tableau, compared to in-place solutions:
  - Was noted by the parties we interviewed to have a lower TCO and provides a higher business value.
  - Allowed users to create BI solutions in 20 percent of the time of most incumbent products. This provides business time-to-market and financial advantages.
  - Had superior ease of use. The survey resulted in Tableau having an excellent ease of use (4.8 out of 5) compared to the other solutions that were rated an average of 2.0.
- Tableau usage resulted in an average of 25 percent annual growth rate of content creators and information consumers. This is in contrast to the incumbent tools where annual usage growth was in decline. While the value to cost for building an analytical culture is hard to determine, the networking effect principle (e.g., the more people who own telephones, the more valuable the telephone is to each owner) concludes that each new user increases the value of all users, resulting in a rapid value accrual when coupled with that level of growth.

IIIE developed a composite enterprise use model from the discovery process and applied the data to its BI TCO ValueV ("Value-Check") Framework. The framework is used to model a competitive analysis with a representative market competitor (Microsoft's Power BI). In our competitive analysis model we found:

- Tableau's three year TCO was 29 percent lower than the competition. (see Figure 1)
- Tableau's ease of use functionality led to lower data exploration/analysis and training costs vs. the competition.

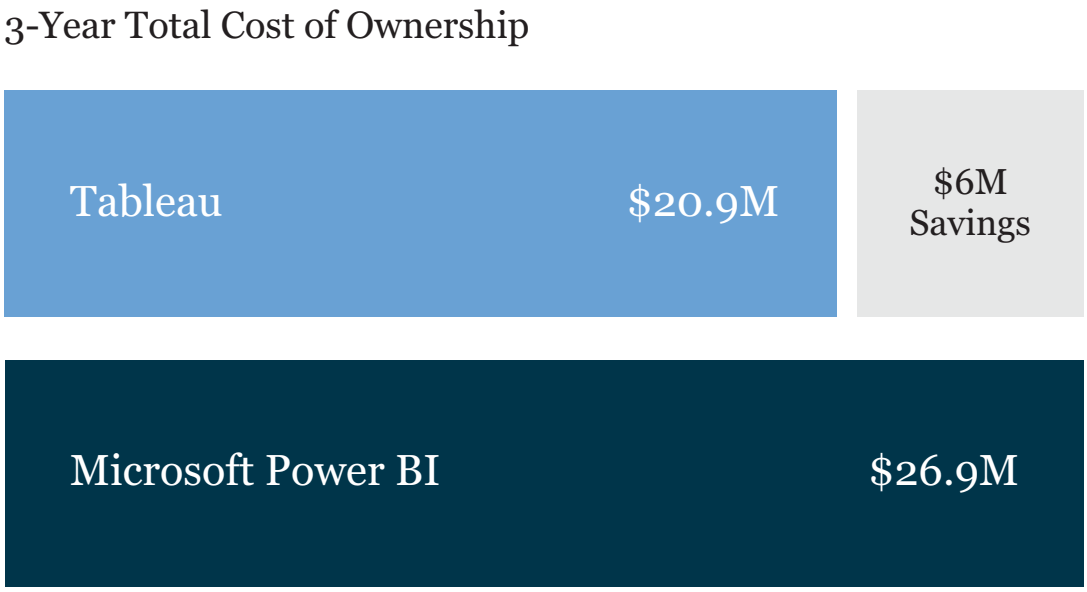

Figure 1. Summary

While we believe the results of this study are fair and accurate, they represent a very specific scenario. We recommend that buyers use the BI ValueV Framework to assess their own TCO. Your results may be different.

Methodology

This research was done in two parts. Initially an Interview Study was undertaken to understand and assess the use of modern BI tools in the real world, specifically Tableau, and understand the decision processes around selection of replacement solutions versus incumbent tools that were recently or (more often) currently still in place.

The second part was to assess the TCO of Tableau versus another modern BI tool, Microsoft Power BI. This study, using a combination of the interviews and publically available sources, is referred to as the Competitive Analysis.

Both of these studies used the IIIE ValueV Business Intelligence TCO model, detailed below, as the framework for the analysis.

A detailed survey and interviews were conducted in seven enterprises within the healthcare, manufacturing, energy, high tech, retail, and financial services industries. In-place solutions included a variety of tools ranging from Excel, custom development (.NET), and traditional BI tools. Tableau installations at the surveyed companies ranged from 110 to over 4,000 users.

Key Findings – Interview Study

Our interview study significantly informed the development of the BI TCO ValueV Framework. It provided validation of the scoping assumptions on size and growth as well as guidance in determining areas of cost and value differences between BI tools.

The incumbent products discovered in our interview process were diverse - IBM Cognos, SAP, SAS, Microsoft SRSS, SAP Crystal Reports / Business Objects, MicroStrategy, Microsoft Excel and Microsoft Power BI. Some customers even had in-house built tools based on development environments like .NET.

The organizational deployment for content creators ranged from BI centers of excellence in the IT, finance or business units to decentralized data analysts. The ratios of content creators to information consumers ranged from 1:1,000 (this could be referred to as a “report factory”) to 40:1 (a case where all end users were considered content creators). This illustrates the broad spectrum of deployment approaches and enablement strategies. The overall average was 93 creators to 1,098 consumers. We used a rounded version of this ratio in our competitive analysis to simplify the presentation of the calculations without significantly diverging from our interview results.

The data analysis and exploration project development and deployment timeframes ranged from several days to two years. There was a varying range of project complexity:

- Simple – Single data source, well defined data and two dimensional views
- Medium – Single or multiple data sources, simple calculations, multivariate analysis
- Complex – Multiple data sources, complex calculations, advanced analytics

The results of our Interview Study are:

- Organizations seek four primary business benefits that drive their deployments:
- Faster time to market (for internal initiatives)
- Making faster or better decisions
- Encouraging an analytic culture
- Finding unique insights
- The top TCO drivers in developing modern BI are:
  - The labor cost – installation, training, data management, content development and usage - of modern BI products significantly exceeds application and infrastructure investments, such as software license fees and compute costs in BI implementations. The ratio of labor to compute costs are more than 85 percent labor cost and less than 15 percent platform cost. This falls in line with historical benchmarks for end-user computing, which is a blueprint for the shift to modern BI.
  - End user learning and training. While simple analysis content can be created "out of the box," more complex content requires some training to maximize efficiency and capability.
  - Hardware and software.
  - IT data management support.
- Tableau, compared to in-place solutions:
  - Was noted by the parties we interviewed to have a lower TCO and provide a higher business value
  - Had superior ease of use. The survey resulted in Tableau having an excellent ease of use (4.8 out of 5) compared to the other solutions that were rated an average of 2.0.
  - This ease of use advantage resulted in allowing users to create BI solutions in 20 – 30 percent of the time of most other products. This provides significant business time-to-market and financial advantages.
- Tableau usage resulted in an average of 25 percent annual growth rate of content creators and information consumers. While the value to cost for building an analytical culture is hard to determine, the networking effect principal (e.g., the more people who own telephones, the more valuable the telephone is to each owner) concludes that each new user increases the value of all users, resulting a rapid value accrual when coupled with that level of growth.

- Best practices around user enablement, including training, support, and user groups are critical in building a community of interest, which fosters broad adoption and effective system utilization.
- Good governance is critical to the success of a modern BI practice. Modern BI is essentially high stakes end-user computing. Data integrity, security, compliance, and access controls are spotlighted when the responsibility shifts to the broader community of data creators and consumers. Software features related to data integrity, access and distribution, control, etc., and that support the governance process, are important to reducing the complexity and risk of broad deployment of these tools.
- The complexity of the BI environment in both platform and projects can significantly increase the TCO of BI implementations.

The BI TCO ValueV Framework™

The BI TCO ValueV Framework was specifically built to capture and analyze the specific costs associated with a BI program. In doing that we are able to isolate costs, like IT support, that are dedicated to this function. The framework was used to assess the BI cost for a group of enterprises and as a reference model for competitive analysis.

Note that the framework includes costs for content creation, information consumption and IT data preparation. We believe a true assessment of modern BI must include usage costs for two reasons.

1. There is a difference in the types of resources required for a BI project, including IT and non-IT personnel. Different products and deployment strategies have different results in this process, therefore different cost dynamics.
2. There is a difference in the amount of resources required to perform a BI project. If one approach or product takes less time to complete, that is a TCO differentiator.

We have defined two categories of end users in this framework. Modern BI users are classified as:

- Content creators: Business and IT analysts who create BI visualizations / dashboards.
- Information consumers: More casual users that use visualizations to make decisions, answer and ask more questions, and perform ad hoc analyses.

The framework is also an IIIE ValueV tool to assess the business value of an organization's specific BI program. This is a variation from a standard TCO model that only looks at "non-productive" costs, and then typically from an IT perspective. BI business value benefits and costs are primarily found in business unit organizations outside of IT departmental costs.

These costs and benefits were aggregated into a composite enterprise that was used for the analysis of BI implementations. The chart of accounts used to assess BI TCO includes:

Platform Costs

Infrastructure Costs

- On-premises hardware
- Infrastructure as a Service Costs (IaaS)
- Data Costs
  - Sources
  - Connectors
  - Compute and storage
- Platform as a Service (PaaS)
  - System services such as databases

Software Costs

BI software license, maintenance, and subscription costs

- On-premises software
- Desktop software
- Software as a Service (SaaS)

Labor Costs

Internal and external resources in the areas of:

Installation, Setup, Support

- Procurement
- IT

Training

- Users
- Course Developers
- Trainers

Data Analysis and Exploration

- Content creators
- Information consumers

Value

- Net Business Value Created - business value created by end users less the cost of the effort used to create the business value

We provide this framework to assist you in performing a competitive BI comparison for your specific environment and situation.

Competitive Analysis

A goal of this white paper is to provide an approach that organizations can use to compare an existing or competitive solution to the Tableau solution. There are many modern BI solutions in the marketplace. To achieve this goal, we used our BI TCO Value√ Framework, detailed above, and applied it to a representative enterprise BI scenario - comparing the Tableau solution to the Microsoft Power BI solution.

As with all TCO analyses, we advise that the data and assumptions used in this analysis may be different than any specific use case and may yield different results. We recommend that this model be used as a framework for an organization to evaluate their own expected costs across the categories. This is a representative analysis.

Use Case Scenario

A scenario of 100 content creators and 1,000 information consumers (see Figure 2) is used as the typical modern BI enterprise user population, a rounded approximation of our survey averages of 93 content creators and 1,098 information consumers. Both creators and consumers increase by our survey average of 25 percent annually over the three year planning horizon. The users are assumed to use an average of 20GB of BI data available to each user sourced from cloud and on-premises data sources - data warehouse / data marts and other data files, with the total data volume for the organization being assumed at 2TB of data. And finally, data visualization is a key analytic need of business users.

"Typical" Scenario	
Beginning Number of Content Creators	100
Beginning Number of Information Consumers	1,000
Growth Rate	25%
Average Size of BI Data Accessed per User	20GB

Figure 2. Typical Scenario

Results

Our analysis for this scenario shows that the Tableau solution has a 3-year TCO that is 29 percent less than the Microsoft solution (see Figure 3).

Assumptions that drive these results are:

- 20GB of BI data is needed per user. This is at the upper range of the survey participants; our perspective is that sophisticated modern BI users are increasingly working with larger data sets. Given the objective to reflect an enterprise deployment where data modeling and governance will be critical capabilities, Microsoft Azure Analysis Services is included within the analysis as a companion to Power BI. Data modeling and governance capabilities for Tableau are built into Tableau Server.
- Based on our interview findings and research, Tableau is easier to use than Microsoft Power BI, especially for medium and complex analysis. This indicates that Tableau users require less effort than Microsoft Power BI users to achieve similar data exploration and analysis results.

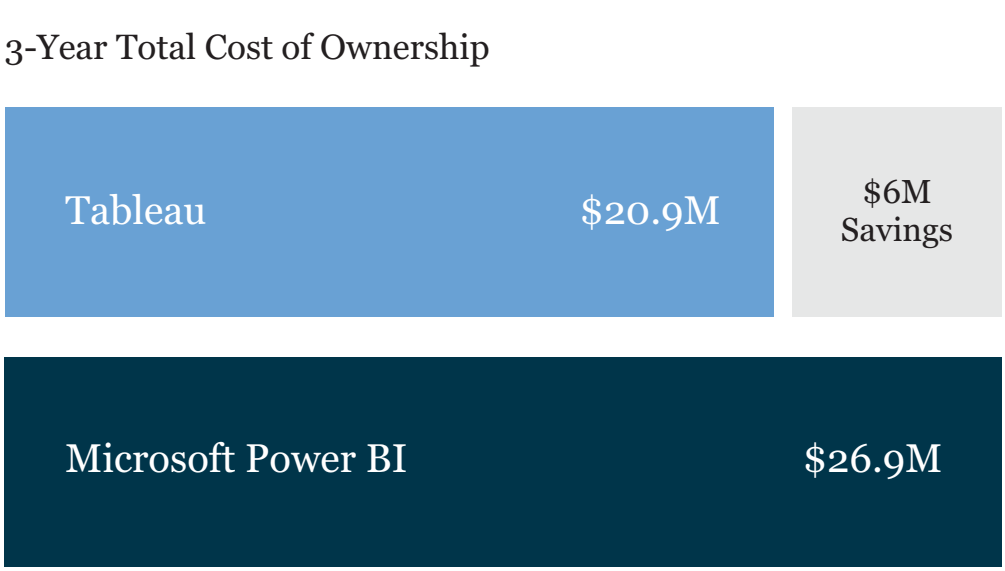

Figure 3. Summary

- Product functionality and features comparison is outside the scope of this study.
- Given that there is a myriad of options for pricing based on platform, volume, and enterprise agreements, we are using per user list pricing in this analysis.
- All costs are in current US dollars

The Tableau BI architecture used in this analysis is:

- End user Tableau Desktop and Tableau Server subscriptions
- Tableau Server instances running on Microsoft Azure IaaS DS13 v2 compute and using P30 Premium Managed Disk storage services

The Microsoft BI architecture used in this analysis is:

- End user Microsoft Power BI Pro and Microsoft Power BI desktop subscriptions
- Microsoft Azure 600DWU SQL DW and P30 Premium Managed Disk storage services
- Microsoft Azure S2 Analysis Services

Financial Analysis

Given these assumptions, the Tableau TCO is $6M less than Microsoft Power BI over a three-year planning horizon (Figure 4). Lower data analysis/exploration, training, and infrastructure costs offset higher software licensing costs.

The most enlightening picture we can show regarding the TCO of business intelligence differences between these two products is illustrated in Figure 4. It shows the difference between labor and platform costs over time in our aggregate enterprise. With 1,100 business users growing at 25 percent annually the cost of labor dwarfs the cost of software and compute resources.

While negotiating the best deal on technology is important, and we encourage you to do so, clearly the area to focus on in managing BI TCO is on the labor front. Further, labor costs can vary widely based on complexity of the data analysis and exploration projects.

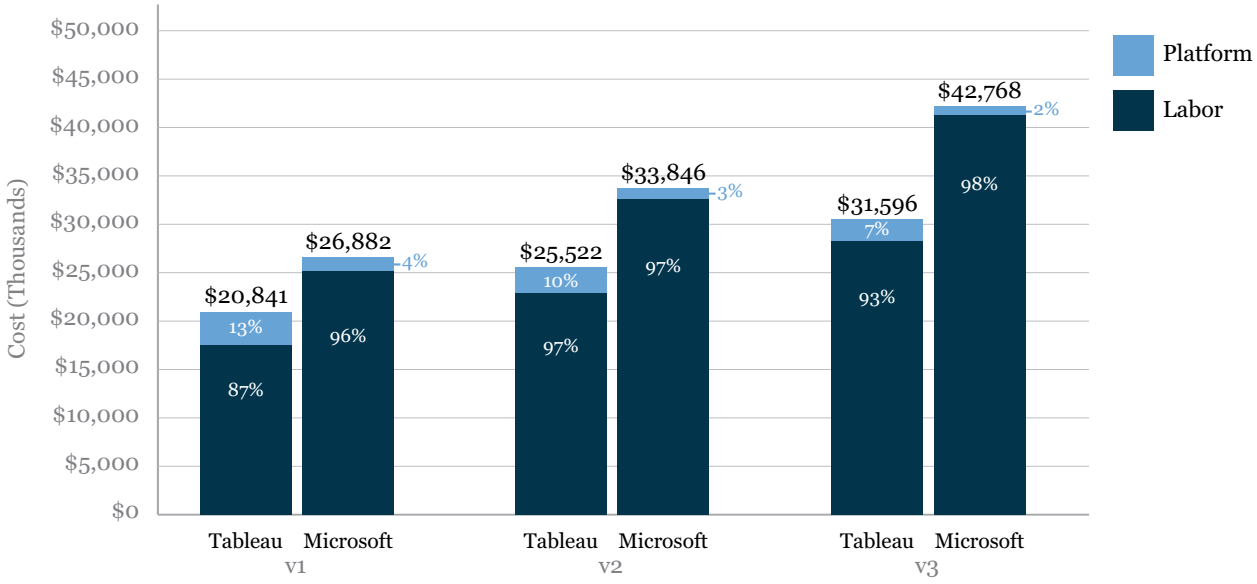

Figure 4. Annual TCO - Platform vs. Labor Differences

It should be noted that while the business user labor cost seems high, this is the productive cost that is creating business value for the enterprise. As we have stated above, the value of this work is perceived to be higher than the cost. Nonetheless, the labor cost is highly sensitive to the implementation of best practices and the level of complexity in the data analysis and exploration.

Total Cost of Ownership

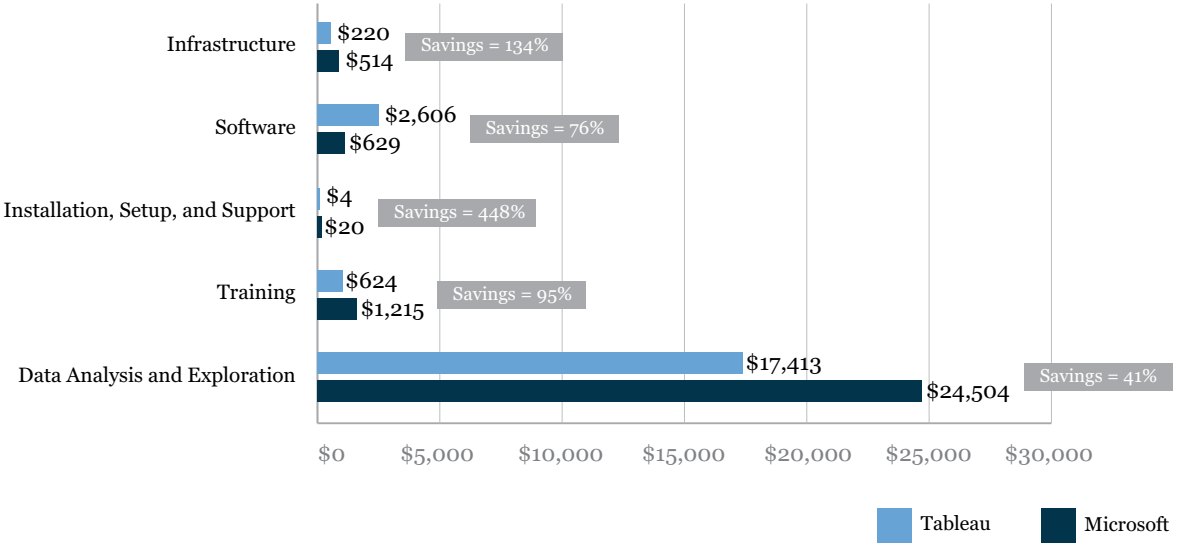

Figure 5. Comparative 3-Year TCO Summary

The TCO Comparison chart above shows the detailed 3-year TCO for the competitive benchmark scenario. Specific costs are in the table below.

Cost Categories	Tableau	MSFT PBI	Difference	% Difference
Platform Costs				
Infrastructure	$219,854	$514,374	$294,200	134%
Software	$2,605,680	$628,890	-$1,976790	-76%
Platform Total	$2,825,534	$1,143,264	-$1,628,590	-60%
Employee Labor Costs				
Installation, Setup, Support	$3,663	$20,066	$16,403	448%
Training	$623,660	$1,215,017	$591,357	95%
Data Analysis & Exploration				
Simple Projects	$6,965,271	$7,679,067	$713,796	10%
Medium Projects	$6,965,271	$10,332,480	$3,367,209	48%
Complex Projects	$3,482,636	$6,492,946	$3,010,311	86%
Employee Labor Total	*$18,040,502*	*$25,739,576*	*$7,699,074*	*43%*
TCO	**$20,866,036**	**$26,882,840**	**$6,016,804**	**29%**

Figure 6. Comparative 3-Year TCO Detail

We found that the complexity of the data analysis and exploration projects was a key differentiator between the two products. Tableau and Power BI costs were relatively comparable with simple projects (as defined below), but as the complexity of the analysis increased, the labor cost differences increased dramatically, up to an 86 percent Tableau cost savings for complex projects. These costs may be further exacerbated by additional software components needed for more complex analyses.

In our framework project complexity is defined as:

- Simple – Single data source, well defined data and two dimensional views
- Medium – Single or multiple data sources, simple calculations, multivariate analysis
- Complex – Multiple data sources, complex calculations, advanced analytics

Platform Costs

The technology investment to enable the computing capability for modern BI includes the investment in software licenses, compute, and storage resources. Other infrastructure elements such as network, bandwidth, and peripherals used for enterprise computing are not part of this analysis.

Given that the predominant trend is that technology costs will continue to fall, and labor costs will continue to rise (see Labor discussion below), we expect the spread between labor and technology to increase.

Key finding: The platform cost is approximately 14 percent of the Tableau TCO and four percent of the Microsoft Power BI TCO. The drivers of falling platform costs include continued migration to cloud computing and software pricing models.

A. Infrastructure

We have selected to compare Tableau and Microsoft Power BI infrastructure hosted on Azure vs. an on-premises infrastructure comparison as Azure hosting is of increasing interest.

The Tableau solution, requiring the Tableau Server product, is hosted on the Azure IaaS compute platform. The Power BI solution, requiring Microsoft SQL Server and SQL Server Analysis Services (SSAS), could be hosted using IaaS solution running the products on the Azure IaaS compute platform or using a PaaS solution consisting of Azure SQL Data Warehouse and Azure Analysis Services (AS). We chose Azure PaaS as it provides cost and scalability flexibility compared to purchasing SQL Server and SSAS running on Azure compute instances.

For Tableau, the Microsoft Azure DS31 v2 compute instance was selected to host Tableau Server software. This instance (56 GB RAM, 400GB HD, 2.4 GHz Intel Xeon® E5-2673 v3 processor) at $1.134 per hour was assumed with 24x7x365 availability, for a one-year cost of $9,934 per instance. One instance was priced in year one and, due to user growth, two instances were priced in years two and three 2 and 3. Consequently the total Tableau compute tier cost is $49,669 ($9,934 * 5).

For Power BI, the Microsoft Azure PaaS architecture - 600 DWU SQL Data Warehouse service at $9.073 per hour and the Azure S2 Analysis Services service at $4.06 per hour were selected. These are middle range tiers within each service - Azure SQL DW services range from 100 DWU ($1.513 per hour) to 6,000 DWU ($90.73 per hour) and Azure AS tiers range from an S0 instance ($1.21 per hour) to and S4 instance ($8.11 per hour).

Adding the two selected PaaS services together is a cost of $13.133 per hour. Over one year this is $114,730 per year or $344,189 for 3 years.

For both Tableau and Power BI, an equal amount of recommended P30 Premium Managed Disk at $135.17 per month per TB was priced for each solution.

For both vendors, the specific Azure platforms / instances to be used in a particular situation depends on a combination of the required performance, memory, etc., and can widely vary from the configurations in this analysis.

Key findings: Both vendors offer end-user desktop systems for visualization and analysis. While Tableau supports Microsoft Windows and Apple Mac systems for both content creators and information consumers, Power BI restricts Power BI Pro users to Windows OS. For the sake of this analysis we assume that users can use their existing desktop system so desktop hardware costs are sunk costs, and there is no cost difference in user desktop systems costs.

Note that while there is an apparent large infrastructure difference between the two solutions, this is largely due to the fact that the Tableau Compute infrastructure includes only hardware costs, while the Power BI compute infrastructure includes the PaaS components Azure SQL Data Warehouse and Azure Analysis Services (AS). These PaaS components include software capabilities, not just hardware. Hence, Tableau software costs are in the following Software section; Power BI software costs are spread between the Infrastructure and Software sections.

	Description	Tableau	MSFT Power BI	Difference From Tableau	% Difference
Compute					
Tableau	Azure DS13 v2	$49,669			
Microsoft Power BI	Azure 600 DWU SQL DW & S2 AS		$344,189		
Total Compute		$49,669	$344,189	$294,520	593%
Storage	P30 Premium Managed Desk	$170,184	$170,184	$0	0%
Total Infrastructure		$219,854	$514,374	$294,520	134%

Figure 7. Infrastructure Costs

The overall user population scenario is that there are 100 content creators and 1,000 information consumers beginning Year 0 with a growth rate of 25 percent, a typical growth rate found in the companies we interviewed.

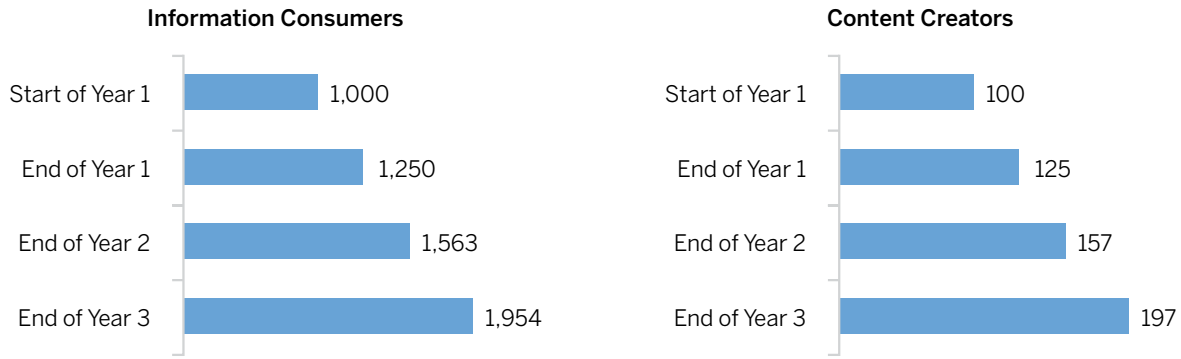

Figure 8. 3-Year user Growth

B. Software

Both Tableau and Microsoft have processor-based as well as individual user-based licensing models. But for the purpose of this comparison, we've chosen to look at per-user pricing. Tableau subscription license fees are $70 per month per Tableau Desktop Professional user and $35 per month per Tableau Server user. Microsoft Power BI Pro is $9.99 / month / user. These are list prices. Your license volume and enterprise agreement or negotiated pricing might be different.

For information consumers, there is significant difference in functionality between these Microsoft Power BI versions and between Power BI and the Tableau Server functionality. In this scenario it is assumed that information consumers utilize modern BI ad hoc and exploration capabilities, not simply view/interact with generated reports. Consequently, to somewhat normalize functionality across users, this analysis assumes:

- All Tableau content creators require a Tableau Desktop Professional license plus a server license and all Microsoft content creators require a Power BI Pro license.

Key findings: Given this assumption, the Microsoft end user software costs are 76 percent lower than Tableau end user software costs.

	Tableau	MSFT Power BI	Difference From Tableau	Savings %
# of Content Creators	197	197	$0	0%
# of Information Consumers	1,954	1,954	$0	0%
User Pricing - Monthly Subscriptions	$2,605,680	$628,890	$1,775,610	-76%

Figure 9. Software Costs

Employee Labor Costs

The employee labor costs included in this analysis are installation, setup, and support, training/learning, and data analysis/exploration. These costs dwarf the platform costs identified above and are also more manageable by the deployment of best practices like Centers of Excellence, and diverse multi-modal training programs.

Additionally, we expect that the demand, supply, and cost of labor are likely to increase over the next few years which will make the differential between labor and platform costs wider over time, especially as it extends beyond our three year planning horizon.

An example of the type of workers that use BI are operations research analysts. The Department of Labor (DoL) defines "operations research analysts use advanced mathematical and analytical methods to help organizations solve problems and make better decisions." DoL forecasts that "employment of Operations Research Analysts to grow 30 percent from 2014 to 2024, much faster than the average for all occupations. As technology advances and companies seek efficiency and cost savings, demand for operations research analysis should continue to grow."

The average fully burdened content creator and consumer salary used in our study is $81, 556. The IT professional salary is $60,312.

A. Installation, Setup, and Support

In this analysis, the initial installation, setup, and support is not a large cost factor, although there is a large percentage difference between the Tableau and Microsoft solutions. It is assumed that the IT staff is experienced and not learning a new set of technologies.

However, Microsoft Power BI requires more installation and setup effort to design and create the contents of the Microsoft Power BI Azure DW and AS solution components. As well, there is a need to install and support the various Microsoft Power BI interface products such as Azure SQL DW, Azure AS, Visual Studio, and Data Gateway.

Key findings: We estimate that one month of additional effort will be required to create an Azure AS data cube(s). This infrastructure complexity is a primary driver of the higher Power BI set up cost.

Additionally, on-going IT support such as creating summary tables, aggregations, using DDL, data cleansing, and other data management activities are required to update and manage the source systems and analysis services like the data warehouse and cubes. This not only increases the cost but also can create bottlenecks in providing fresh data to the modern BI users. This content creation complexity also factors into the initiative development section below and is a strong driver of cost as the level of effort increases.

The following table combines this type of IT installation setup and support activities.

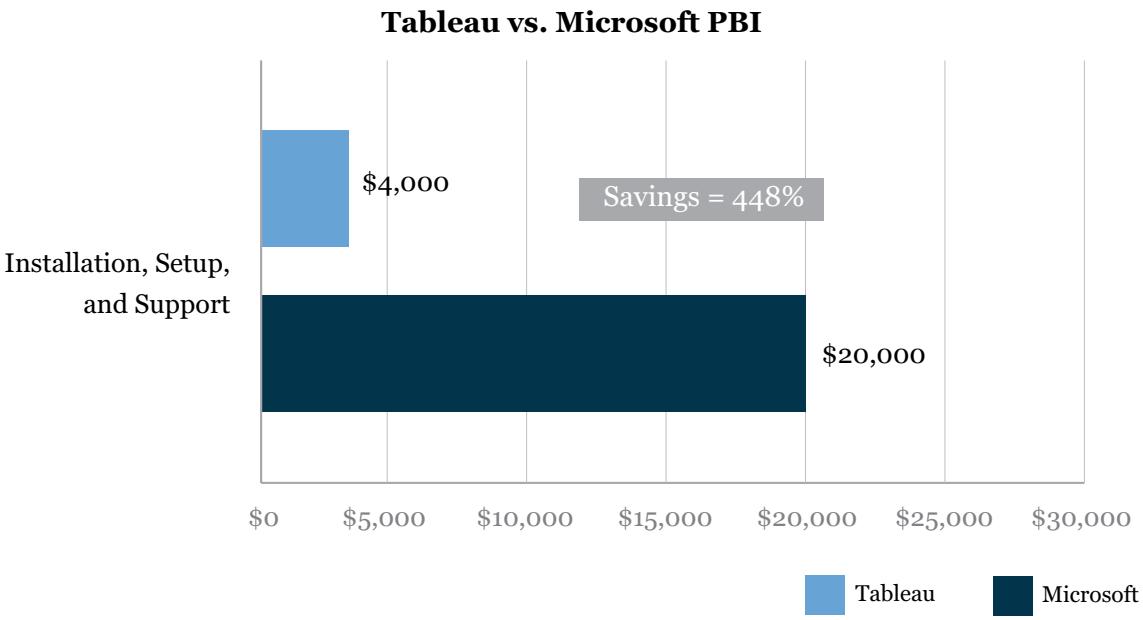

Figure 10. Installation, Setup, and Support

B. Training/Learning

Training is the cost of delivering and/or attending tool courses. Learning is the additional cost needed to attain proficiency in the tools.

It is assumed that both Tableau and the Microsoft Power BI solution require training, with the Microsoft solution requiring more as there are more products to learn (see training courses below). In addition, it is assumed that while Tableau users can access source system data and develop/share corporate data models in the Tableau server as needed, the Microsoft solution depends on the development of SSAS data cubes (for corporate data models), conservatively estimated at a total of one-month worth of effort.

Key findings: Based on our interviews, we found that Microsoft Power BI requires more end user training than Tableau.

This rationale is two-fold:

1. Tableau is widely considered to be easier to use and hence requires less training
2. Microsoft Power BI requires knowledge of proprietary end-user languages such as DAX (for Excel) and MDX (for SSAS) as well as IT knowledge of Azure SQL DW, AS and integration with other Microsoft products, such as the Data Management Gateway, etc.

Costs were created based on published online and classroom courses rates and the user time required to undertake the training to reach a nominal level of proficiency.

	Tableau Hours	MSFT Power BI Hours
Content Creator - Online	7	6
Content Creator - Classroom	16	64
Information Consumer - Online	4	7
Information Consumer - Classroom	0	0
IT - Online	0	0
IT - Classroom	56	40

Figure 11. Training Assumptions

The following training courses used in the analysis:

Tableau: Total Hours = 52		
Content Creators	Information Consumers	IT
On-Line / Self	On-Line / Self	Classroom
Getting Started	Starter Kit	Deploy and Manage Tableau Server
Connecting to Data	Getting Started	Security with Tableau Server
Visual Analytics	Visual Analytics	Server Administration
Dashboards and Stories	Dashboards and Stories	Server Architecture
Mapping	Calculations	
Calculations		
Why is Tableau Doing That?	Classroom	
Publish to Tableau Online	Desktop I Fundamentals	
Manage Tableau Online	Desktop II Intermediate	
Collaborate with Tableau Server	Visual Analytics	
Publish to Tableau Server		
How To Collaborate with Tableau Online		
Classroom		
Desktop I Fundamentals		
Desktop II Intermediate		
Desktop III Advanced		
Visual Analytics		

Microsoft Power BI: Total Hours = 84		
Content Creators	Information Consumers	IT
On-Line / Self	On-Line / Self	Classroom
Getting Started	Getting Started	20767A - Implementing a SQL Server Data Warehouse
Modeling	Visualizations	
Visualizations	Exploring Data	
Exploring Data	Power BI and Excel	
Power BI and Excel	SQLBI classes	
Publishing and Sharing	Course 10989B: Analyzing Data with Power BI	
Introduction to DAX	Analyzing and Visualizing Data with Power BI	
	Dashboard in a Day	
Classroom	Power Pivot	
Querying Data with Transact-SQL		
Analyzing Data with Power BI		
Analyzing Data with Power BI		
Third Party Classes		
SSAS Tabular		
DAX Expert		
Power Pivot		
SSAS Expert		

For both Tableau and competitive solutions, we believe that learning a product (becoming proficient) will require a 50 percent addition to training, e.g. if training requires 8 hours then training + learning = 12 hours. Once again, this is provided as an example for you to customize based on your own environment.

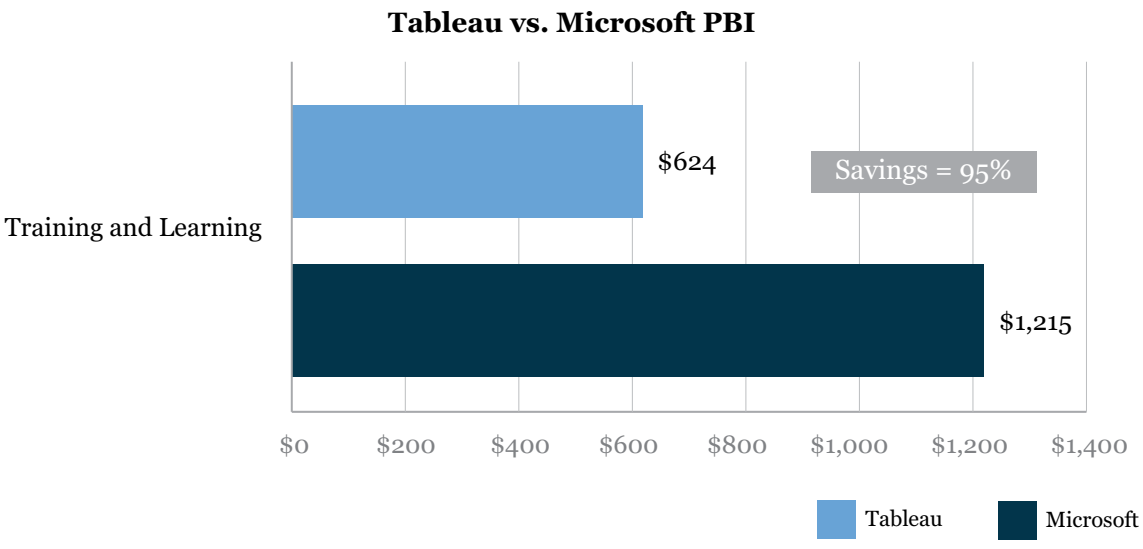

Figure 12. Training and Learning

C. Data Analysis and Exploration Projects

These projects consist of the creation of dashboards, multi-dimensional visualizations, and/or reports and data models that can be used across the organizations with multiple views. These can be thought of as a collection of tools that enable a department (sales, human resources, etc.) or a business unit's analytics capability.

Results of the Interview Study informed the following data analysis and exploration projects:

Time Spent in the Tool

- Content creators on average spend about 20 percent of their time involved in BI activities. Of course, some content creators spend 100 percent of their time in BI work and others may only spend 10 percent of their time. A typical information consumers spends ~one hour per week using a BI tool. Some creators only look at the tool for monthly reports; some use the tool hours each day.

- Tableau users spend only 25 percent of the time users of legacy tools spend in creating visualizations and using the tool (75 percent time savings).

Data / IT Support

- A key swing factor in the time spent in developing and using BI content is time spent performing data source definition, manipulation, modification, and management. Depending on the organization, this work is performed by content creators, IT, or a combination of these two resource types.
- Tableau required the least amount of BI professional / IT support.
- The use of Microsoft Power BI requires significantly more IT support than Tableau, requiring the use of Microsoft products/languages such as of DAX, MDX, Visual Studio, etc. A SQL Server data warehouse / data mart DB needs to be used in the Microsoft solution. New analyses can require technical skills to create SSAS cubes to deliver new results across new data dimensions.

End User Satisfaction

- Tableau scored 4.5 – 4.8 on a 1 (low) – 5 (high) scale along ease of use, end user enablement, and product functionality dimensions, compared to legacy system scores between 1 and 2.
- This supports the point above that Tableau users need to spend less time in the Tableau vs. other tools to deliver the same results.
- In some cases, when asked how long it would take to deliver in a legacy tool what is being delivered by Tableau, respondents replied "we couldn't deliver the business value in our other tool that Tableau delivers."

Key findings: Our interviews and research support a conclusion that new data analysis and exploration projects will require more effort by Microsoft Power BI users than Tableau users to create the equivalent functionality. This increases with the complexity of the analysis.

Projects are one of three categories:

- Simple – Single data source, well defined data, and two dimensional views
- Medium – Single or multiple data sources, simple calculations, multivariate analysis
- High – Multiple data sources, complex calculations, advanced analytics

In this analysis 40 percent of the projects are simple complexity, 40 percent are medium, and 20 percent are of high complexity.

The consensus of interviewees who are familiar with both Tableau and Power BI is that developing in and using Tableau is a timesaver, particularly as complexity increases. For simple projects, content creators are estimated to require 20 percent more effort to deliver the same results due to increased data manipulation time and reliance on calculation languages like the previously mentioned DAX, overcoming the built-in 1GB file limitation, and the necessity of aggregating/filtering data sets to get around the 3500 data point visualization limit. For the simple case, there is no difference in the time spent by information consumers, who in this use case are only looking at charts with little data analysis and exploration.

For complex projects, it was estimated that Power BI content creators require two and one-half times the effort of Tableau content creators. This difference is due to the factors previously mentioned – as well as the need for significant additional data manipulations and structuring such as creating SSAS data cubes. Our interviewees thought that Power BI information consumer users would spend 20 percent more time in data analysis and exploration compared to Tableau users, in performing equivalent activities due largely to the lack of dashboard navigation and storytelling capabilities in Power BI as well as fewer interactive features, like input parameters and multi-data point selection.

Medium projects were estimated to require the average time between simple and medium projects, for both content creators and information consumers.

Power BI Effort Multiplier (Compared to Tableau)				
BI Analysis Complexity	Simple	Medium	Complex	Weighted Average
Percentage of Users	40%	40%	20%	
	Complexity Multiplier			
Content Creators	1.2	1.85	2.5	1.72
Information Consumers	1	1.1	1.2	1.08

Figure 13. Level of Effort

In summary, based on the level of complexity of the BI analysis, we used an "extra effort" multiplier for Power BI ranging from 1.2 to 2.5 for content creators to between 1 and 1.2 for information consumers. This analysis results in a level of effort multiplier of 1.72 for Power BI content creators and 1.08 for Power BI information consumers, compared to Tableau.

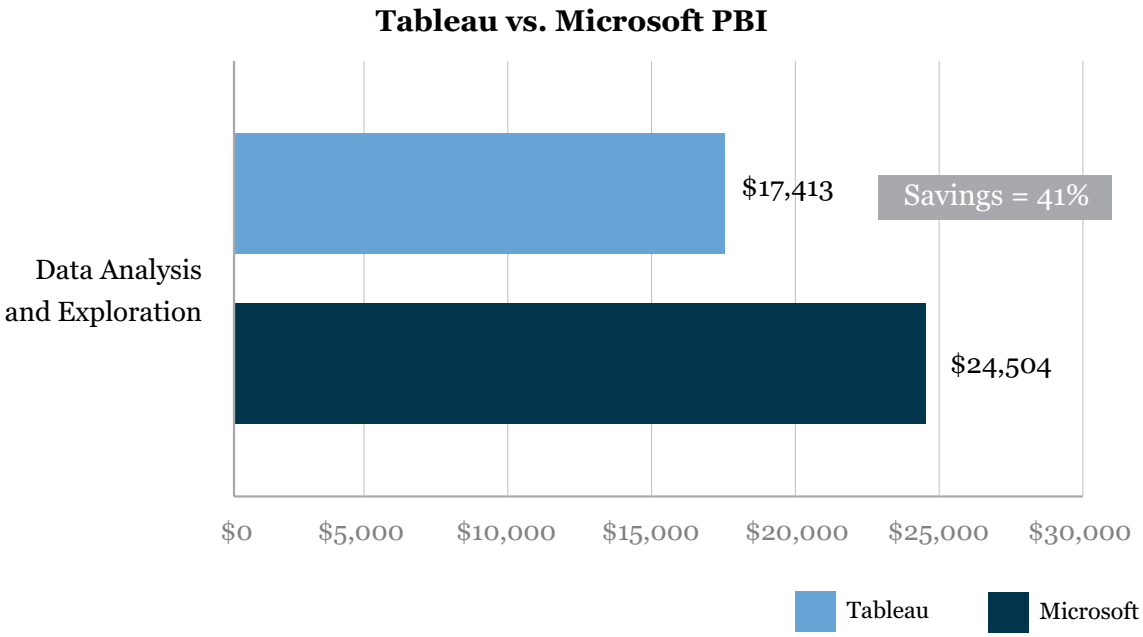

Figure 14. Initiative Development

Ultimately for the blended project, the analysis result is that Tableau content creation takes 8 hours and Power BI content creation requires ~14 hours (8 hours * the 1.72 level of effort factor) to complete the same task, inclusive of data management tasks. This effort is in addition, and prerequisite to, the IT support noted above. Information consumers on average take about 5 minutes more using the Power BI solution than Tableau to find the same insights.

Net BI Business Value Created

The primary reason for BI deployment is to increase business value with an IT solution. Even as we consider the business value created by a BI solution as a neutral factor in our competitive analysis, it is clearly the largest financial component in this analysis, dwarfing the investment and operating costs. Typically, a study of net BI business value would identify the value produced by BI users. The calculation of total BI business value realization would then consist of the overall BI business value produced (projects' business value) minus the BI usage cost (user time spent in the tools). This creates a standard ROI. However, the "Return" in a BI ROI can vary widely. Our secondary research shows that studies of successful BI projects range from just over 100 percent to over 1,200 percent. Therefore, measuring the business value created by BI initiatives is outside the scope of this white paper, as it can vary widely based on the business area involved, initiative success, measurement approach, and other factors.

We believe that there may be significant differences in the business value achieved by specific initiatives and products, and recommend that your specific initiatives be reviewed for competitive value differences.

We see the ROI being delivered over several dimensions:

- Business value
  - Specific to the project impact on revenue, expense, employee retention, etc.
- Time to market
  - Our interviewees think Tableau can deliver a typical project faster than Power BI and much faster than legacy tools
- Number of employees (FTEs) required
  - For a typical project, our interviews reveal that Tableau requires less staff to deliver similar results.
- Insights
  - Our interviewees think that the Tableau user interface is easier to use and more easily allows users to develop insights.
- Quantity and quality of resources
  - Our study indicates that lower levels of technical resource expenses are required to produce equal results.

Strategy Recommendations

In essence, modern BI is end-user computing and follows the TCO pattern established when personal computers were introduced - that the cost of labor is typically four times the cost of hardware and software. End-user computing labor is also much greater than IT labor, as some of the IT function is shifted out of IT. Further, training / learning become critical success factors.

We have found that the TCO of modern BI has the same ratio. For example, Tableau TCO is 85 percent external to the IT department and 15 percent attributable to the cost of the platform. This is accentuated by the deployment of modern BI in the cloud, where consumption-based infrastructure costs are lower than on-premises solutions.

This was confirmed in our interviews with large enterprise users of modern BI, and contrasts significantly with legacy deployments where IT maintained control of the content, and the creation and distribution of content.

From a strategic planning standpoint, we recommend that enterprises invest upfront on the basic infrastructure of BI analytics in a solution that is designed for widespread adoption, ease of use, productivity, and agility in data access, content creation, and consumption. This scenario will likely get a higher return on business benefits.

Enterprises that pursue solutions that are technically (infrastructure and architecture) less complex, and with less IT friction, are likely to have lower cost of implementation, deployment, and support.

Our findings show that best practices will create an "analytics first" culture that embraces visual analytics, reaching a deeper level of capabilities and encouraging broader adoption.

These best practices include:

Five Steps To Take	Business Value
1. Provide easy-to-use data visualization and ad hoc data discovery.	Better / faster decision-making
2. Enable business user non-IT self-service.	Speed and flexibility
3. Build a semantic and metadata layer. Curate data - categorize data on a validation or other scale – e.g. Validated, Not Validated, Do Not Use.	Data-based decision-making
4. Enable user and/or machine-assisted discovery (AI, machine learning, advanced analytics) rather than support only static or structured queries.	Improved insights
5. Consider cloud rather than on-premises solution deployments.	• Lower costs • Business agility

- Comprehensive multi-modal training programs
- Decentralized but governed organization
- Libraries of preconfigured templates, reusable components, and applications

Study Participant Qualitative Feedback

1. “When you look at it [Tableau], based off what you’re investing and what you’re actually going to get in return, it really pays dividends, and I’ve seen this twice now.” - Global Director of Data and Analytics
2. “We’re just finding so much insight now into our data whereas before we were relying finding it in column 137 in a 500-page spreadsheet.” – Manager, Business Intelligence and Analytics
3. “I do think Tableau’s support and community is unlike any other community, not just talking about the company, but also talking about the people that use the software product are unlike any other community.” - Manager, Business intelligence and Analytics
4. (Regarding value to cost ratio) – “You’re looking at a three-year timeframe. I’d probably say three to one, something in that range.” - Global Director of Data and Analytics
5. “More than anything else, people say Tableau can be the Wild West, and it can be if you let it get out of hand. That’s why we have all these governance things in place… Because Tableau can become so pervasive and so disruptive, it needs to have some structure around it. Consequently, if you have that structure around it, it’s actually a lot more successful than if you don’t.” - Global Director of Data and Analytics
6. “I think first and foremost, in the space of descriptive analytics, (Tableau) is great. From bespoke development by the average person sitting out here who overuses Excel and PowerPoint, it’s perfect for that. Second on my list would be user-friendly both from the creation as well as the consumption of data, the query ability, the drag and drop approach… And third, I think that their availability of training materials and guidance and absorbable formats – people like to watch a five-minute video on a specific topic and move on. So that’s been a great resource.” – Partner, Consulting

About the International Institute of IT Economics

At the intersection of IT and Finance, IIIE is dedicated to a better understanding of the business value of Information Technology investments.

IIIE is a research and consulting firm specializing in assessing the business value of IT. We work with IT providers to validate and certify their financial assessment tools (TCO, ROI, etc.). We also work with IT buyers to vet their business justification proposals for IT investments.

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Bill is acknowledged as the creator of the IT Total Cost of Ownership (TCO) methodology and corresponding models. His work at Gartner over a twenty-year tenure led to the establishment of TCO as an industry standard for calculating IT costs across all IT platforms. Since Gartner, he has continued to provide thought leadership as a researcher on the economic and financial impact of new IT paradigms such as Cloud IT, Mobile and Big Data.

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Peter has over 20 years of successfully providing business and IT solutions to clients - quantifying the business value of technology products and solutions, identifying competitive advantage, and developing product strategies. Peter has worked as a consultant in large companies such as IBM, PWC (Management Consulting), in startups, and at his own consultancy.

Peter provides industry thought leadership. He is a co-author of several Harvard Business School Working Papers, co-author of Data Warehousing: Practical Advice from the Experts, and is a certified project manager (PMP). He was a Contributing Editor to DBMS / Intelligence Enterprise magazine, has authored numerous articles, and has been quoted in industry publications.