

FORRESTER®

The Total Economic Impact™ Of Data Virtualization

Using The Denodo Platform

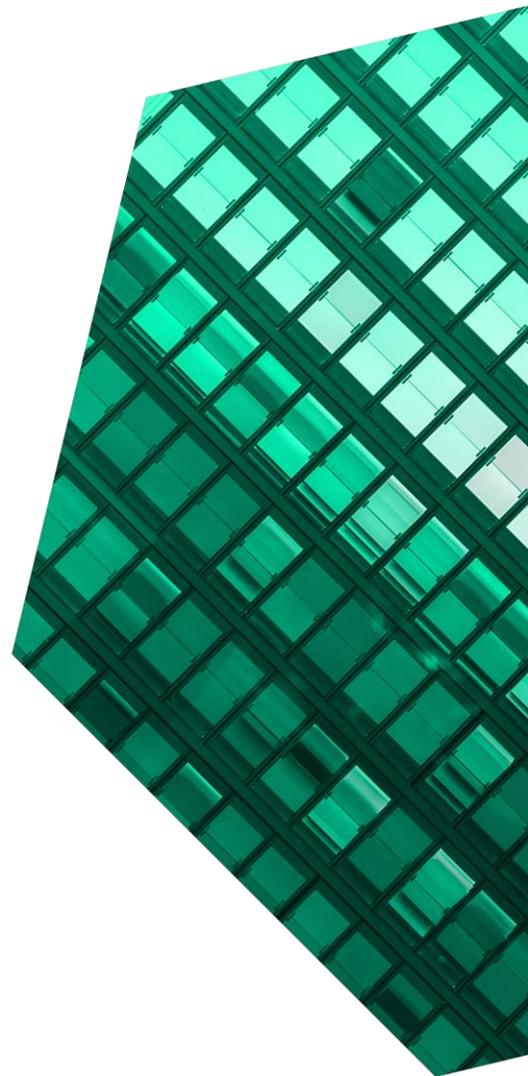
Cost Savings And Business Benefits
Enabled By the Denodo Platform

OCTOBER 2021

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Executive Summary

Data virtualization helps organizations access data across disparate sources and deliver a unified view of the data faster, cheaper, and using fewer resources than traditional data integration approaches. In this TEI, data virtualization delivered 83% reduction in time-to-revenue and 65% decrease in delivery times over extract, transform, and load (ETL) processes. Denodo's logical data fabric goes beyond data virtualization, enabling organizations to effectively integrate and manage their data where it lives without replicating it, allowing both technical and non-technical users to quickly answer key business questions using a data-driven approach.

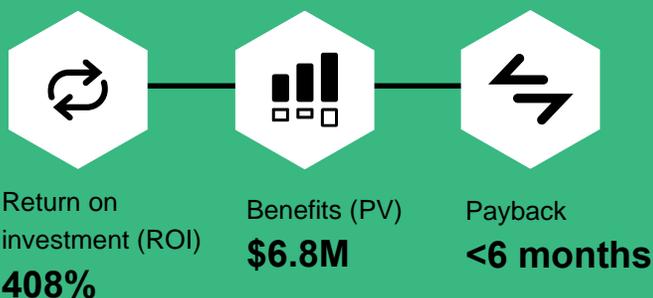
Organizations struggle with the fact that organizational data exists in many different places, across different platforms, and in different formats making it difficult to perform analytics or develop a holistic understanding of the business, customer, or specific market. Despite these challenges, organizations still recognize the potential value that lies in their data. And they therefore invest heavily in data scientists, analytics platforms, and digital tools to stitch data from disparate sources together in an attempt to make it more usable and valuable.

Data virtualization technology offers an elegant solution to many of these issues by virtually integrating all enterprise data that is siloed across the disparate systems and providing centralized security, governance, and management capabilities so the data is available to business users in real time.

Data fabric technology takes the data virtualization a step further by automating data management functions using artificial intelligence/machine learning (AI/ML) and providing additional semantic capabilities through data catalog, data preparation, and data modeling. This reduces the burden on IT and data engineering teams that traditionally leveraged ETL processes.

The Denodo Platform is a logical data fabric that uses the data virtualization approach to virtually integrate an organization's disparate data without replicating any data. Denodo delivers the unified data via a single data access layer for workers to access and govern data, run queries, develop new tools or

KEY STATISTICS



processes, and perform analytics and data science. The Denodo Platform includes an intuitive web-based interface, a dynamic query optimizer for faster access, an AI/ML-driven dynamic data catalog, automated infrastructure management and lifecycle management tools, and a number of other features to make accessing, leveraging, and securing organizational data simpler for business users.

This Total Economic Impact™ (TEI) study examines the potential return on investment (ROI) enterprises may realize by deploying the Denodo Platform.¹ The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of the Denodo Platform on their organizations.

“With Denodo, the real value is that we deliver value to the business faster. If I have to wait a month to get answers to a business question, chances are the question is no longer relevant. Denodo lets us get answers quickly so we can make better strategic decisions faster.”

— VP of data and analytics, real estate

To better understand the benefits, costs, and risks associated with this investment, Forrester interviewed key decision-makers across four companies in different industries with experience using the Denodo Platform. For the purposes of this study, Forrester aggregated the interviewees’ experiences and combined the results into a single [composite organization](#).

Prior to using the Denodo Platform, these interviewees noted how their organizations were primarily leveraging ETL, data lakes, and data warehouses to house data and perform analytics. ETL processes and legacy data storage techniques both prevented these organizations from utilizing all of their desired data and created significant bottlenecks due to the time and effort required by their data engineers to produce data sets, run queries, and perform other requests from business users. Additionally, organizations incurred significant costs trying to store data, especially on-premises.

Other key challenges expressed by interviewees include the difficulties in creating centralized data

access, expanding to new use cases, democratizing data so business users can answer their own questions, and reducing the time, effort, and costs required to produce meaningful insights.

After the investment in the Denodo Platform, the interviewees were able to virtualize their disparate data sources into a single logical data layer, giving business users the tools needed to perform their own analysis and giving data engineering teams the necessary time and data to build useful, reusable tools and add value to the business.

Key results from the investment include faster data delivery, improved operational efficiency, efficiencies for data scientists, improved profit, and reduced legacy integration costs.

KEY FINDINGS

Quantified benefits. Risk-adjusted present value (PV) quantified benefits include:

- **Decreased data delivery times by 65% over ETL processes, saving \$1.7 million.** With Denodo, organizations were able to move away from slower, more labor-intensive ETL processes. Denodo automatically integrates disparate data sources, optimizes query requests, and builds in a centralized governance architecture so that organizations can access the data they need faster.

The IT manager in the manufacturing industry explained: “Denodo is giving us a lot of advantages over an ETL process, especially when people need real-time data made available to them very quickly. Time-wise and project-wise, Denodo has helped speed up many, many projects and enabled my team to do more.”

“Since deploying Denodo, we have gone anywhere from a couple of days or weeks to less than a day to deliver data sets.”

IT manager, manufacturing

- **Improved operational efficiency driven by data-driven decision-making, saving \$1.7 million.** Denodo’s data virtualization software enables organizations to create complex data sets using real-time data across multiple data sources that they were not able to create before. These new data sets can provide insight on decisions to effectively reduce operations costs. Some examples of improvements that customers attributed to Denodo include: 1) creating a real-time campaign monitoring tool to measure the performance of marketing campaigns; 2)

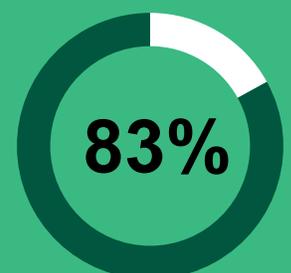
developing a customer churn predictor tool to predict/mitigate churn; 3) gaining a better understanding of which products should be decommissioned and when; 4) developing a probability of success tool to assess whether a project is likely to succeed and produce revenue; 5) developing a quality assurance (QA) system to improve compliance with regulations; and 6) enabling business users on different teams, such as finance and operations, to leverage data in a more self-service way.

The VP of data and analytics in the real estate company said: “From the [operations] perspective, being able to provide business users with the capability to start asking and answering questions themselves ... it has really given us the ability to see around the corner. There is no way that my team, even if we dropped everything, would have been able to react to a situation like the pandemic as fast as we did without Denodo.”

- **Improved efficiency for data scientists, who spend 67% less time on preparing data for modeling with Denodo, saving \$698,000.** Denodo automates integration of data across disparate sources using AI/ML, allowing data scientists to quickly and intuitively get what they need to build models and develop insights. Denodo’s software also ensures that the data being analyzed for modeling is consistent, of quality, and secure through its governance and security features.

The VP of data and analytics in the real estate industry said: “With Denodo, our data scientists

Reduction in time-to-revenue



no longer spend 30% of their time on data wrangling and data curation. They can now spend that time on modeling since we can logically model our data within Denodo.”

- **Improved profit of \$1.2 million, realized through 83% faster time-to-value for projects leveraging data.** With Denodo, organizations can leverage new data sets that they did not have the capabilities to create before. These new data sets can inform revenue-driving projects, which improve the bottom line. Denodo can also improve the speed at which existing revenue-driving projects are completed, improving the time-to-value.

The director of enterprise architecture in the life sciences industry said: “Let’s say it took our data science team three months to write this model for a project, and now we can get that down to one week, we are increasing the probability that the project succeeds as opposed to slowing it down and we can release our product sooner. These are multimillion dollar products, so even delaying them one day can be a million dollars or more in missed revenue.”

- **Reduction in legacy integration costs, saving \$1.5 million.** Denodo can gradually replace existing ETL processes with a faster, more reliable data virtualization layer, without forcing an organization to retire these processes all at once or affecting the end user’s experience. Denodo’s features can also allow organizations to retire now-redundant legacy software systems, saving on licensing fees and support costs.

The IT manager in the manufacturing industry said: “Part of this investment is getting rid of all of those old ETL or integration technologies. The licenses themselves were around \$200,000 a year, but the big cost was in the staff to maintain the technology. We had five head count every year for just maintaining those technologies, and with Denodo, we have been able to accelerate

the decommissioning of tools and reallocating staff.”

Unquantified benefits. Benefits that are not quantified for this study include:

- **Organizational flexibility and agility.** The VP of data and analytics in the real estate industry illustrated how the Denodo Platform empowered non-technical users to do more with their data: “With Denodo, technical people don’t need training because the software is intuitive to them. And now, we can serve an audience that we’ve never been able to serve before — our business users. They can actually increase their technical skills to be able to be more self-sufficient and answering their own questions with data now.”
- **Customer and employee satisfaction.** The IT manager in the manufacturing industry touched on Denodo’s ability to boost both customer and employee satisfaction: “For me, the important part about Denodo is that I have happy clients and happy customers internally. It has been great for our IT team because we are no longer telling our customers to wait for the next patch, or that we don’t have certain functionality. We now have enough time, and the proper capabilities to deliver good solutions to my customers and that makes me and my team happy.”
- **Peace of mind for audits, security, and governance.** The VP of data and analytics in the real estate industry explained how Denodo has impacted multiple parts of their business: “For finance, we have been able to reduce the time it takes to report out to Wall Street every quarter because we can complete the data and compliance checks faster, so that has been huge. From the governance perspective, we leverage Denodo to put in all of the metadata around where the data elements come from, who owns them, etc., so we have one place where we govern all of our data. And from the data security perspective, knowing that we have one

centralized data security model gives us peace of mind that we only have one place to audit.”

Costs. Risk-adjusted PV costs include:

- **Denodo licensing costs total \$653K over three years.** Interviewees reported that Denodo licensing costs were typically lower than the amount they previously spent on ETL processing and integration tools. They also noted that they deploy additional technologies as part of their integrated data fabric.
- **Deployment and support costs total \$687K over three years.** Interviewees reported deployment times between one and three months to get the platform up and running to virtualize additional data sources. Support and maintenance were typically handled by a team that supported more than one solution with part of their time devoted exclusively to Denodo.

The decision-maker interviews and financial analysis found that a composite organization experiences benefits of \$6.8M over three years versus costs of \$1.34M, adding up to a net present value (NPV) of \$5.46M and an ROI of 408%.



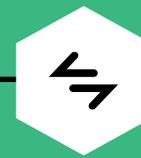
ROI
408%



BENEFITS PV
\$6.80M



NPV
\$5.46M



PAYBACK
<6 months

Benefits (Three-Year)

Decrease in data delivery times over ETL

\$1.7M

Improved operational efficiency with data-driven decision making

\$1.7M

Efficiency gain for data scientists

\$698K

Improved profit

\$1.2M

Reduced legacy integration costs

\$1.5M

TEI FRAMEWORK AND METHODOLOGY

From the information provided in the interviews, Forrester constructed a Total Economic Impact™ framework for those organizations considering an investment in the Denodo Platform.

The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision. Forrester took a multistep approach to evaluate the impact that the Denodo Platform can have on an organization.

DISCLOSURES

Readers should be aware of the following:

This study is commissioned by Denodo and delivered by Forrester Consulting. It is not meant to be used as a competitive analysis.

Forrester makes no assumptions as to the potential ROI that other organizations will receive. Forrester strongly advises that readers use their own estimates within the framework provided in the study to determine the appropriateness of an investment in the Denodo Platform.

Denodo reviewed and provided feedback to Forrester, but Forrester maintains editorial control over the study and its findings and does not accept changes to the study that contradict Forrester's findings or obscure the meaning of the study.

Denodo provided the customer names for the interviews but did not participate in the interviews.



DUE DILIGENCE

Interviewed Denodo stakeholders and Forrester analysts to gather data relative to the Denodo Platform.



DECISION-MAKER INTERVIEWS

Interviewed four decision-makers at organizations using the Denodo Platform to obtain data with respect to costs, benefits, and risks.



COMPOSITE ORGANIZATION

Designed a composite organization based on characteristics of the interviewees' organizations.



FINANCIAL MODEL FRAMEWORK

Constructed a financial model representative of the interviews using the TEI methodology and risk-adjusted the financial model based on issues and concerns of the decision-makers.



CASE STUDY

Employed four fundamental elements of TEI in modeling the investment impact: benefits, costs, flexibility, and risks. Given the increasing sophistication of ROI analyses related to IT investments, Forrester's TEI methodology provides a complete picture of the total economic impact of purchase decisions. Please see Appendix A for additional information on the TEI methodology.

The Denodo Platform Customer Journey

Drivers leading to the Denodo Platform investment

Interviewed Decision-Makers			
Interviewee	Industry	Region	Annual Revenue
Director of enterprise architecture	Life sciences	Global	\$43B
Lead architect and head of data	Financial services	Global	\$13B
IT manager in big data and AI services	Manufacturing	Global	\$2.8B
VP of big data and analytics	Real estate	Global	\$4.4B

KEY CHALLENGES

Prior to adopting the Denodo Platform, organizations primarily relied on ETL processes to build data sets and leverage data warehouses for their mix of on-premises and cloud data storage.

The interviewees noted how their organizations struggled with common challenges, including:

- **Centralized data access model using physical architectures, which created bottlenecks and limited data use.** With legacy solutions, organizations relied on a centralized team of data scientists to produce reports, run queries, and serve the needs of the business. As the number of use cases and data sources expanded, data teams were increasingly challenged to keep up with demand, causing delays and missing opportunities. Organizations recognized this bottleneck and looked to democratizing their data to enable more self-service for business users.

The VP of data analytics in the real estate industry said: “In the old world, it was a centrally managed capability where the business came to my team with a request and then the output from my team was a report. Even though my team was pretty large at that time, we were always limited because we couldn’t serve 2,000 employees with a nine-person team and be nimble about it.”

Also, they added, “Moving something from development to testing literally took three people’s full days’ worth of work to get that stuff out of one environment into another.”

- **Resource constraints around data workers.** Data and analytics teams were overwhelmed with requests from business users. This forced organizations to develop prioritization strategies, creating long wait times for answers to critical questions and even skipping potential beneficial projects or initiatives due to lack of time or resources.

The director of enterprise architecture in the life sciences industry said: “With our previous solution, it was hard to onboard new use cases because we have a limited amount of data engineers who understand that platform, and they take up jobs on priority. This created a bottleneck for onboarding new use cases onto the platform.”

- **Lack of flexibility for data scientists.** Organizations wanted to provide their data science teams with more data and better tools so they could work with data in new ways and produce new insights. The IT manager in the manufacturing industry said: “Our data team had to stick to a rigid process in our old environment,

so we wanted to give them more flexibility and enable them to do their work in an easier way. We have achieved this with Denodo, and it helps the whole organization tremendously.”

- **Long delays in finding answers to key business problems, resulting in a longer time-to-value.** Due to the previously outlined challenges, organizations struggled to accommodate the volume of questions and requests coming from the business. This forced data teams to prioritize certain projects over others, resulting in increased time-to-value for revenue-driving projects and potentially forgoing profits.

The VP of data and analytics in the real estate industry said: “The fastest we could ever move in our old stack was monthly releases, and that was assuming we were not bringing in any new data. If we were bringing in new data, the best that we could do was a month and a half to turnaround a new data set coming into the data warehouse and get it modeled within the reporting tool to produce a report. It was a huge amount of time. It was a monolith.”

- **Unable to perform data analyses across certain disparate data sources.** With organizational data stored all across the network both on-premises and in the cloud, and in various formats, it was extremely challenging for organizations to build a comprehensive dashboard or leverage certain data sets as part of an analysis. Without these data sets, organizations were unable to make data-informed decisions on key business questions concerning topics like customer churn, marketing performance, product lifecycle management, and energy savings, resulting in inefficient budgetary spend and decreased KPIs across multiple realms of the business.

The IT manager in the manufacturing industry said, “We wanted to create a dashboard that

would pull in all of our different data sources, but we realized that it would not be possible because we had many data sources that couldn’t be combined into such a reporting tool.”

WHY DENODO

The interviewees’ organizations searched for a solution that could:

- **Provide leadership in the data virtualization space.** Customers recognized their need for a data virtualization platform, and they found that through research and vendor evaluations Denodo had the strongest product.

A lead architect in the financial service industry explained, “The first step for us was realizing that we needed a data virtualization platform to move our business forward, and after an extensive evaluation, we selected Denodo.”

The VP of data and analytics in the real estate industry said, “We did a survey of the data virtualization market and Denodo definitely had the strongest product.”

- **Accelerate time-to-value.** Interviewees were impressed with the speed Denodo enables, significantly reducing wait times and allowing organizations to realize value faster and have capacity to answer more questions than before.

The VP of data and analytics in the real estate industry said, “To me, it all boils down to speed to insights. Not having to wait to get the question that you have top-of-mind answered with data is huge.”

- **Enable the digital transformation journey at various stages.** Interviewees cited Denodo as a key driver of their digital transformation efforts because of the way it provides access to data and helps people understand the benefits of transformation.

The VP of data and analytics in the real estate industry said, “[Denodo was] a part of our big

evolution away from the old world into the new world.”

The IT manager in manufacturing said, “Denodo enables us to have all of these fancy applications and is a key reason why the cloud transformation is moving so smoothly.”

COMPOSITE ORGANIZATION

Based on the interviews, Forrester constructed a TEI framework, a composite company, and a ROI analysis that illustrates the areas financially affected. The composite organization is representative of the four decision-makers that Forrester interviewed and is used to present the aggregate financial analysis in the next section. The composite organization has the following characteristics:

Description of composite. A global, multibillion-dollar financial services organization has an annual operating budget of \$1 billion. The composite organization has a strong brand, global operations, and a large customer base that is engaged and willing to try new product and service offerings. Prior to investing in Denodo, the composite organization leveraged ETL processes with a data warehouse and a mix of on-premises and cloud data sources.

Deployment characteristics. The composite organization has global operations with a distributed team of 15 data scientists. The data team processes 420 data-set requests annually, growing at a rate of 10% per year. Data sources are constantly being virtualized onto the Denodo Platform with most data sets being virtualized in the first two years after deployment.

Key assumptions

- \$5 billion revenue
- Financial services
- Global reach
- Team of 15 data scientists
- 420 annual data-set requests
- Annual operation budget of \$1 billion

Analysis Of Benefits

■ Quantified benefit data as applied to the composite

Total Benefits						
Ref.	Benefit	Year 1	Year 2	Year 3	Total	Present Value
Atr	Decreased data delivery times over ETL	\$625,118	\$687,629	\$756,095	\$2,068,841	\$1,704,642
Btr	Improved operational efficiency enabled by data-driven decision-making	\$510,000	\$680,000	\$850,000	\$2,040,000	\$1,664,237
Ctr	Improved efficiency for data scientists	\$264,263	\$281,880	\$299,498	\$845,640	\$698,214
Dtr	Improved profit	\$347,195	\$500,195	\$653,195	\$1,500,586	\$1,219,772
Etr	Reduction in legacy integration costs	\$495,000	\$630,000	\$720,000	\$1,845,000	\$1,511,608
	Total benefits (risk-adjusted)	\$2,241,575	\$2,779,705	\$3,278,787	\$8,300,067	\$6,798,473

DECREASED DATA DELIVERY TIMES OVER ETL

Evidence and data. Before deploying Denodo, interviewees stated that their organizations primarily relied on ETL processes to fulfill data-set requests. As a result, these organizations were unable to leverage real-time data as these ETL processes were limited by batch processing.

The Denodo Platform enabled interviewees to execute data pulls at their organizations faster and to deploy releases more regularly. With Denodo, multiple types of data workers were able to realize immediate efficiencies in fulfilling their data-set requests driven by the Denodo Platform’s capabilities, such as optimized querying and letting data live where it is stored.

- The VP of data and analytics in the real estate industry spoke to the efficiency gains their organization had experienced in adding new data sources and pulling data with Denodo: “Now, we can do weekly releases. We’re able to add new data sources within 2 to 3 hours. We’re about 60% faster than we were in the old world.”

Modeling and assumptions.

- The composite organization receives 420 data-set requests per year in Year 1. This amount grows by 10% year-over-year.
- Prior to Denodo being deployed, each of these data sets takes about seven days to fulfill using standard ETL processes.
- With Denodo deployed, there is a 65% improvement in data-set delivery times over ETL processes.
- The average, fully burdened salary for Denodo end users who were originally tasked with fulfilling these queries is \$189,000.
- The productivity capture of these data workers’ time is 50%.



Reduction in delivery times over ETL

65%

Risks. This benefit can vary due to uncertainty related to:

- The number of datasets fulfillment requests an organization receives each year.
- The average length of time each dataset request took to fulfill using standard ETL processes.
- The average length of time each dataset request took to fulfill using the Denodo Platform.
- Denodo end-user salaries.

- The productivity capture of the end-users' time.

Results. To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year, risk-adjusted total PV (discounted at 10%) of \$1,704,642.

Decreased Data Delivery Times Over ETL

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
A1	Data-set requests per year	Composite	420	462	508
A2	Average cumulative time for analysts to fulfill data-set requests using ETL processes (days)	Composite	7	7	7
A3	Percentage improvement in delivery time with Denodo	Composite	65%	65%	65%
A4	Average cumulative time for analysts to fulfill data-set requests with Denodo (days)	$A2*(1-A3)$	2.45	2.45	2.45
A5	Average fully burdened salary for end users	$\$140K*1.35$	\$189,000	\$189,000	\$189,000
A6	Productivity capture	Composite	50%	50%	50%
At	Decreased data delivery times over ETL	$(A1*A2)/260*A3*A5*A6$	\$694,575	\$764,033	\$840,105
	Risk adjustment	↓10%			
Atr	Decreased data delivery times over ETL (risk-adjusted)		\$625,118	\$687,629	\$756,095
Three-year total: \$2,068,841			Three-year present value: \$1,704,642		

IMPROVED OPERATIONAL EFFICIENCY ENABLED BY DATA-DRIVEN DECISION-MAKING

Evidence and data. Interviewees expressed the difficulty their organizations faced in combining certain data sets spread across disparate sources to conduct complex, real-time data analyses before Denodo. Often, even when these analyses were technically feasible, the time and labor resources required to execute them resulted in organizations deprioritizing them and being unable to garner key insights from them.

With Denodo, interviewees stated their organizations were now able to curate these complex, real-time data sets across multiple data sources. These new data sets were then used to inform key business decisions related to operational efficiency, such as monitoring marketing campaign performance, optimizing energy efficiency, predicting customer churn, and determining product lifecycle and thereby reducing overall costs for the business.

- The VP of data and analytics in the real estate industry spoke to the power that Denodo-enabled

data analyses have offered their organization: “Now we are providing a new set of analytics that is tied to our corporate KPIs, but the metrics that we report on the operational front are much more like, ‘What’s my next best action in the course of my day?’ They are really serving the field with information about what can they do on a daily basis to help drive those corporate KPIs, but the metrics they’re driving are within their control.”

- The IT manager in the manufacturing industry illustrated one of the new cost-saving dashboards their organization was able to create with Denodo’s data virtualization layer, “Coming back to this energy saving system, to be honest, from the architecture perspective, I do not think that it would have been possible to do without Denodo.”

Modeling and assumptions.

- The composite organization holds an annual operations budget of \$1 billion.
- The Denodo Platform enables the composite organization to conduct complex, real-time data analyses to improve internal operations, initially impacting 0.3% of the operations budget and growing to 0.5% by Year 3.

- The Denodo Platform acts as one of the several enabling layers of the organization’s entire data fabric, contributing to 20% of the total benefit.

Risks. This benefit can vary due to uncertainty related to:

- The annual operations budget of a given organization.
- The percentage of the operating budget improved by database analyses enabled by Denodo.
- Denodo’s attribution factor to the holistic data fabric.

“I would say our data workers are at least 50% faster.”

IT manager, manufacturing

Results. To account for these risks, Forrester adjusted this benefit downward by 15%, yielding a three-year, risk-adjusted total PV of \$1,664,237.

Improved Operational Efficiency Enabled By Data-Driven Decision-Making					
Ref.	Metric	Calculation	Year 1	Year 2	Year 3
B1	Annual operations budget	Composite	\$1.0B	\$1.0B	\$1.0B
B2	Operational efficiency improvements driven by database analyses enabled by Denodo	Composite	0.3%	0.4%	0.5%
B3	Denodo attribution factor	Composite	20%	20%	20%
Bt	Improved operational efficiency enabled by data-driven decision-making	B1*B2*B3	\$600,000	\$800,000	\$1,000,000
	Risk adjustment	↓15%			
Btr	Improved operational efficiency enabled by data-driven decision-making (risk-adjusted)		\$510,000	\$680,000	\$850,000
Three-year total: \$2,040,000			Three-year present value: \$1,664,237		

IMPROVED EFFICIENCY FOR DATA SCIENTISTS

Evidence and data. To varying degrees, data scientists are often tasked with preparing and integrating the data they intend to use for modeling purposes. When data is spread across multiple data sources with different governance and security architectures affecting each, preparing this data for use can be time-intensive for data scientists who need consistent, quality data before they can develop their machine learning models.

Denodo allows data scientists to quickly query the data they need from a centralized platform to perform their advanced modeling techniques with peace of mind that the data they are leveraging is consistent, of high quality, and adheres to organizational standards on both governance and security.

- The VP of data and analytics in the real estate industry explained how the Denodo Platform’s ability to accommodate objects representing complex algorithms to make data science modeling more powerful and faster: “When our data scientists complete their model, we virtualize it and wrap an API on top of it so that that model gets inputs, and it produces an output that we bring that back into Denodo. Now we can run data science models as if they were a database table, so let’s say I’m in Denodo and I can see that there is an object in Denodo called pricing optimization. When I use that object, I’m going to pass in this information and the return that it gives me is the result of that algorithm. The huge power there is now I don’t know anything about that algorithm. That algorithm is essentially an

Excel function to me, but behind the scenes, I’m churning through data science.”

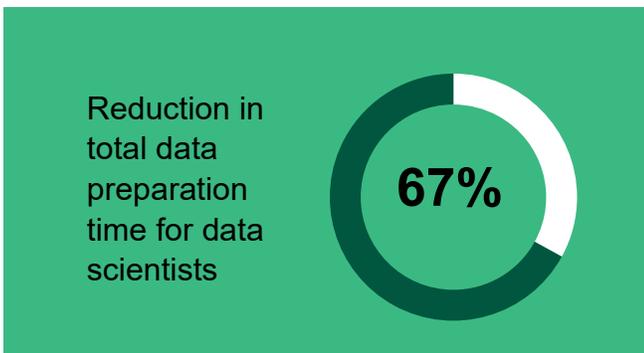
Modeling and assumptions.

- The composite organization employs 15 data scientists in Year 1, and it hires one additional headcount both in Years 2 and 3.
- The average, fully burdened salary of data scientists at the organization is \$195,750.
- In Denodo’s legacy environment, data scientists spent 30% of their time preparing and integrating data for modeling.
- With Denodo, data scientists now only spend 10% of their time preparing and integrating data for modeling.
- The productivity capture for these data scientists’ recouped time is 50%.

Risks. This benefit can vary due to uncertainty related to:

- The number of data scientists who are employed at an organization.
- The fully burdened salaries of data scientists at an organization.
- The percentage of time that data scientists spend on integration and preparation before Denodo.
- The percentage of time that data scientists spend on integration and preparation with Denodo.
- The productivity capture of data scientists’ recouped time.

Results. To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year, risk-adjusted total PV of \$698,214.



Improved Efficiency For Data Scientists

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
C1	Number of employed data scientists	Composite	15	16	17
C2	Fully burdened yearly salaries of data scientists	\$145K*1.35	\$195,750	\$195,750	\$195,750
C3	Percentage of time data scientists spent integrating and preparing data for modeling before Denodo	Composite	30%	30%	30%
C4	Percentage of time data scientists spent integrating and preparing data for modeling with Denodo	Composite	10%	10%	10%
C5	Percentage reduction in total data preparation effort for data scientists	(C3-C4)/C3	67%	67%	67%
C6	Productivity capture	Composite	50%	50%	50%
Ct	Improved efficiency for data scientists	$C1 * C2 * (C3 - C4) * C6$	\$293,625	\$313,200	\$332,775
	Risk adjustment	↓10%			
Ctr	Improved efficiency for data scientists (risk-adjusted)		\$264,263	\$281,880	\$299,498
Three-year total: \$845,640			Three-year present value: \$698,214		

IMPROVED PROFIT

Evidence and data. The Denodo Platform decreases time-to-value for revenue-generating projects that leverage data, particularly those that rely on machine learning models. Denodo also enables net new revenue-generating projects to be sold, as the platform makes the creation of complex and unique data sets possible. With project revenue recognized more quickly and additional projects being sold as a result of Denodo’s ability to curate data sets across multiple data sources, interviewees reported increased revenue and profit as a result of the Denodo Platform.

- The VP of data and analytics in the real estate industry spoke to the qualitative benefit that reduced time-to-value has had on their organization: “There was value in delivering value to the business faster. To me, that’s the most important thing because if I have a business question and I have to wait for a month to get the answer to that question. Chances are that

question is no longer relevant because something in the business has already changed. That’s one of the key benefits [of Denodo] there.”

Modeling and assumptions.

- The composite organization sells 10 projects per year in perpetuity that leverage data.
- Each of these projects is worth \$2,000,000 each.
- Before Denodo, each project requires six weeks before it can begin producing revenue.
- With Denodo, each project takes one week before it can begin producing revenue.
- The composite organization’s profit margin for revenue-driving projects is 15%.
- With Denodo, the composite organization is able to sell two new projects in Year 1, five in Year 2, and eight in Year 3.
- Denodo’s attribution factor to the holistic data fabric represents 20% of the total benefit.

Risks. This benefit can vary due to uncertainty related to:

- The number of projects sold that leverage data each year.
- The amount of revenue each newly sold project is worth.
- The average project time-to-value before Denodo.
- The reduction in average project time-to-value with Denodo.
- Each organization’s profit margin on revenue-driving projects.
- The number of additional projects an organization is able to sell with Denodo each year.
- Denodo’s attribution factor to the holistic data fabric.

Results. To account for these risks, Forrester adjusted this benefit downward by 15%, yielding a three-year, risk-adjusted total PV of \$1,219,772.

Improved Profit					
Ref.	Metric	Calculation	Year 1	Year 2	Year 3
D1	Number of projects sold that leverage data	Composite	10	10	10
D2	Annual value of each newly launched project	Composite	\$2,000,000	\$2,000,000	\$2,000,000
D3	Revenue per week from each project (rounded)	D2/52	\$38,462	\$38,462	\$38,462
D4	Project time-to-value before Denodo (weeks)	Composite	6	6	6
D5	Project time-to-value with Denodo (weeks)	Composite	1	1	1
D6	Reduction in project time-to-revenue driven by Denodo's modeling efficiencies	1-(D5/D4)	83%	83%	83%
D7	Profit margin	Composite	15%	15%	15%
D8	Subtotal: Profit acceleration from reduced project time-to-value	$D1 * D3 * (D4 - D5) * D7$	\$288,465	\$288,465	\$288,465
D9	Number of additional projects sold enabled by Denodo	Composite	2	5	8
D10	Denodo attribution factor	Composite	20%	20%	20%
D11	Subtotal: Profit from net new projects	$D2 * D9 * D7 * D10$	\$120,000	\$300,000	\$480,000
Dt	Improved profit	$D1 * D2 * D4 * D7 * D10$	\$408,465	\$588,465	\$768,465
	Risk adjustment	↓15%			
Dtr	Improved profit (risk-adjusted)		\$347,195	\$500,195	\$653,195
Three-year total: \$1,500,586			Three-year present value: \$1,219,772		

REDUCTION IN LEGACY INTEGRATION COSTS

Evidence and data. In their organizations' legacy environments, interviewees stated how they used a mix of data integration tools to bridge their disparate data sources. These legacy tools included ETL processes, licensing fees, and labor costs for support and maintenance.

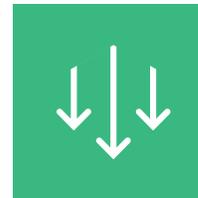
With the Denodo Platform, organizations were able to retire many of these legacy tools and processes that Denodo's features can now perform, while increasing the overall capacity and agility of their data fabric.

- The VP of data and analytics in the real estate industry spoke to the number of ETL processes their organization was able to retire after their Denodo deployment: "We've been able to retire somewhere between 250 and 300 ETL programs because we could now virtualize them with Denodo."
- The holistic legacy savings realized from deploying Denodo went beyond retired ETL processes, with the interviewee stating: "With Denodo, we're saving about \$400,000 a year. The flip side of that is Denodo has allowed us to do a lot more now, so we've grown that footprint, and we've replaced that \$400,000 with a whole bunch of new things we can never do in the old world."

Modeling and assumptions.

- The composite organization is able to retire about half of its ETL processes in Year 1 of Denodo's deployment, equating to \$250,000.
- The composite organization retires more of its legacy ETL processes in Year 2, as it seeks to integrate the Denodo Platform with its legacy systems in a seamless, gradual manner.
- By Year 3, the composite organization is able to retire the bulk of its ETL systems, saving \$500,000 annually.

- Also in Year 1, the composite organization is able to retire \$300,000 worth of data integration licenses and the associated labor support costs in perpetuity, as Denodo can now independently perform these processes.



Annual avoided legacy system costs

\$300K

Risks. This benefit can vary due to uncertainty related to:

- The annual cost of the legacy ETL systems that an organization was using before replacing these processes with Denodo.
- The annual cost of retired legacy data integration tool licenses and their associated support costs.

Results. To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year, risk-adjusted total PV of \$1,511,608.

Reduction In Legacy Integration Costs

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
E1	Cost of legacy ETL systems	Composite	\$250,000	\$400,000	\$500,000
E2	Cost of legacy systems for retired data integration tools	Composite	\$300,000	\$300,000	\$300,000
Et	Reduction in legacy integration costs	E1+E2	\$550,000	\$700,000	\$800,000
	Risk adjustment	↓10%			
Etr	Reduction in legacy integration costs (risk-adjusted)		\$495,000	\$630,000	\$720,000
Three-year total: \$1,845,000			Three-year present value: \$1,511,608		

UNQUANTIFIED BENEFITS

Additional benefits that customers experienced but were not able to quantify include:

- Organizational flexibility and agility.** Denodo empowers organizations to democratize their data access for both technical and non-technical users by lowering the barriers associated with conducting analyses and queries across disparate data sources. With less pressure on technical users to prepare data sets for non-technical users, organizations can relieve pressure on resource-constrained data workers and overcome bottlenecks. These factors allow users and business leaders to more quickly conduct their analyses and answer key business questions in real time, respectively.

The IT manager in the manufacturing industry acknowledged the role Denodo played in facilitating collaborative, flexible work at their organization: “Denodo is the right tool for collaborative, flexible work and giving the business more room to create flexible applications for the future. It’s proved so until today.”

- Customer and employee satisfaction.** Denodo Platform’s intuitive user interface allows users to fulfill data sets more efficiently and less painfully than with legacy integration techniques and tools, boosting employee satisfaction and giving them more time to work on creating better quality products. Quicker turnarounds on data set deliveries and more time for employees to work on building higher quality products results in higher customer satisfaction.

In one example, the VP of data and analytics in the real estate industry illustrated how Denodo’s architecture kept end users from being negatively impacted by changes to back-end infrastructure: “We did a migration of a huge data warehouse, and it was entirely transparent to the users because none of the reports changed, and none of the connections changed. Denodo did all of that switching for us.”

- Peace of mind for audits, security, and governance.** Interviewees stated that Denodo helped their organizations gain insight into their organization’s governance, compliance, and data security architectures through a centralized platform. This additional visibility not only offered business leaders peace of mind, but it also

ensured that compliance checks and audits could be more quickly and accurately fulfilled.

The lead architect in the financial services industry praised the Denodo Platform's visibility to their organization's governance architecture and compliance adherence: "Denodo gives us full visibility into what the data [is] used for so we can be compliant and have this in our governance. I think that's been beneficial for the organization and that's also part of the reason why delivering the GDPR [General Data Protection Regulation] insight report is one of the first compliance use cases we benefited from with Denodo."

The VP of data and analytics in the real estate industry spoke to Denodo's impact on organizational data security: "From the data security perspective, Denodo has absolutely [benefited us]. Like any company, we have sensitive data components and knowing that we have one centralized data security model gives us peace of mind that we have one place to audit."

FLEXIBILITY

The value of flexibility is unique to each customer. There are multiple scenarios in which a customer might implement the Denodo Platform and later realize additional uses and business opportunities, including:

- **Ability to start simple and get complex over time.** Denodo's flexible platform permits organizations to enable certain features of the platform without having to retire their entire legacy ecosystem at once. Interviewees appreciated Denodo's flexibility in deployment options, as organizations had the opportunity to begin with more foundational features and curate a more complex deployment over time.
- **Future automation.** Interviewees mentioned their organizations were looking forward to expanded automation capabilities for certain use

cases enabled within the Denodo Platform.

These automated setups would allow their data workers to realize additional efficiencies beyond the current environment.

Flexibility would also be quantified when evaluated as part of a specific project (described in more detail in [Appendix A](#)).

Analysis Of Costs

■ Quantified cost data as applied to the composite

Total Costs							
Ref.	Cost	Initial	Year 1	Year 2	Year 3	Total	Present Value
Ftr	Denodo licensing costs	\$0	\$262,500	\$262,500	\$262,500	\$787,500	\$652,799
Gtr	Deployment and support costs	\$147,840	\$216,700	\$216,700	\$216,700	\$797,940	\$686,741
	Total costs (risk-adjusted)	\$147,840	\$479,200	\$479,200	\$479,200	\$1,585,440	\$1,339,540

DENODO LICENSING COSTS

Evidence and data. Interviewees reported that they paid an annual licensing fee to Denodo.

- Prior to deploying the Denodo Platform, organizations had to work with multiple data integration tool vendors before being able to consolidate most of their data integration licenses with Denodo.
- The license fee included an unlimited number of queries, data sources, users, and data volume, as well as an unlimited number of non-production storage.
- This fee was primarily driven by the number of production cores that were active each year.

Modeling and assumptions. This section explains how the modeling is done.

- The composite organization pays \$250,000 per year for Denodo's licensing fee.
- Rates are negotiated with specific deployment size requirements.

Risks. This benefit can vary due to uncertainty related to:

- Specific rates based on deployment characteristics.

Results. To account for these risks, Forrester adjusted this cost upward by 5%, yielding a three-year, risk-adjusted total PV (discounted at 10%) of \$652,799.

Denodo Licensing Costs							
Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	
F1	Denodo licensing costs	Composite	\$0	\$250,000	\$250,000	\$250,000	
Ft	Denodo licensing costs	F1	\$0	\$250,000	\$250,000	\$250,000	
	Risk adjustment	↑5%					
Ftr	Denodo licensing costs (risk-adjusted)		\$0	\$262,500	\$262,500	\$262,500	
Three-year total: \$787,500			Three-year present value: \$652,799				

DEPLOYMENT AND SUPPORT COSTS

Evidence and data. Costs included software engineers who were tasked with initial deployment, support FTEs that maintained the Denodo Platform, and additional licensing fees associated with complementary solutions which helped organizations realize the full benefits of the Denodo Platform.

- Interviewees stated that initial deployment costs typically involved contributions from an internal software engineering team, as well as outsourced technical services. The initialization phase was complete within a few months.
- Once the Denodo Platform had been initialized and deployed, a small number of support engineers were required to keep the platform running. Additional licenses were also purchased to ensure that interviewed organizations could reap as much benefit out of the platform as possible.

Modeling and assumptions. This section explains how the modeling is done.

- The initial deployment requires two software engineers spending 20% of their time working on implementing the Denodo Platform.
- The initial deployment period also includes outsourced technical services totaling \$75,000 until Denodo is up and running.
- The annual, fully burdened salary of these software engineers is \$148,500.
- After the initial deployment, 1.5 support FTEs are required to maintain and upkeep the platform.
- The annual, fully burdened salary of these support engineers is \$108,000.
- The composite organization purchases additional technical licenses to support and complement Denodo's features, totaling \$35,000 each year following the initial deployment.

Risks. This benefit can vary due to uncertainty related to:

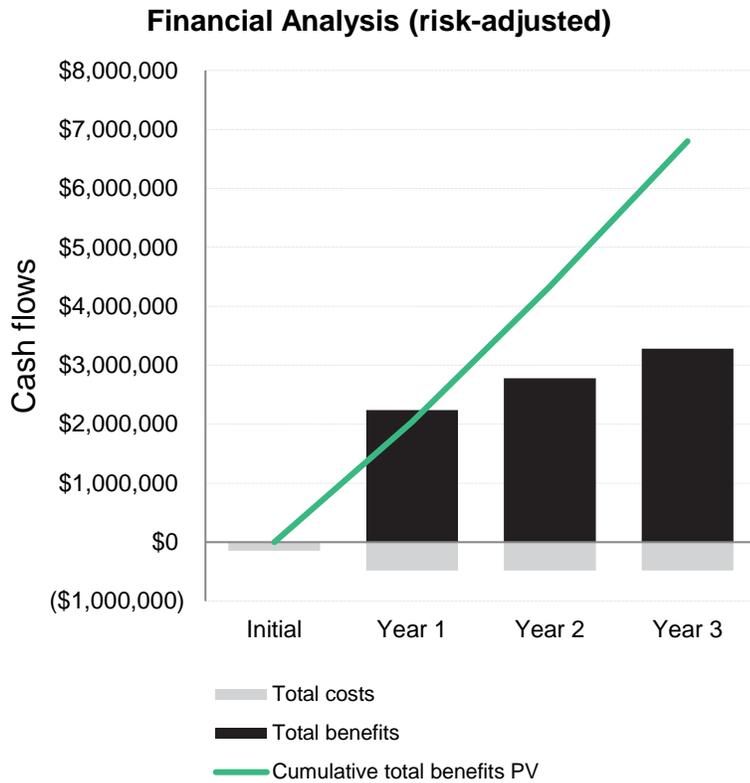
- The size of the initial deployment and following phases.
- The cost of outsourced, third-party services required to complete the initial deployment and set up of the platform.
- The annual, fully burdened salary of software engineers.
- The number of support FTEs required to maintain and support the Denodo Platform.
- The annual, fully burdened salary of support engineers.
- The number and cost of additional solution licenses purchased to realize the full benefits of the Denodo Platform.

Results. To account for these risks, Forrester adjusted this cost upward by 10%, yielding a three-year, risk-adjusted total PV of \$686,741.

Deployment And Support Costs						
Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
G1	Deployment FTEs	Composite	2	0	0	0
G2	Fully burdened salary of software engineer	$\$110,000 \times 1.35$	\$148,500	\$0	\$0	\$0
G3	Percent of time spent on Denodo deployment	Composite	20%			
G4	Support FTEs	Composite	0	1.5	1.5	1.5
G5	Fully burdened salary of support engineer	$\$80,000 \times 1.35$		\$108,000	\$108,000	\$108,000
G6	Ongoing third-party support solution costs	Composite	\$75,000	\$35,000	\$35,000	\$35,000
Gt	Deployment and support costs	$(G1 \times G2 \times G3) + (G4 \times G5) + G6$	\$134,400	\$197,000	\$197,000	\$197,000
	Risk adjustment	↑10%				
Gtr	Deployment and support costs (risk-adjusted)		\$147,840	\$216,700	\$216,700	\$216,700
Three-year total: \$797,940			Three-year present value: \$686,741			

Financial Summary

CONSOLIDATED THREE-YEAR RISK-ADJUSTED METRICS



The financial results calculated in the Benefits and Costs sections can be used to determine the ROI, NPV, and payback period for the composite organization's investment. Forrester assumes a yearly discount rate of 10% for this analysis.

These risk-adjusted ROI, NPV, and payback period values are determined by applying risk-adjustment factors to the unadjusted results in each Benefit and Cost section.

Cash Flow Analysis (Risk-Adjusted Estimates)

	Initial	Year 1	Year 2	Year 3	Total	Present Value
Total costs	(\$147,840)	(\$479,200)	(\$479,200)	(\$479,200)	(\$1,585,440)	(\$1,339,540)
Total benefits	\$0	\$2,241,575	\$2,779,705	\$3,278,787	\$8,300,067	\$6,798,473
Net benefits	(\$147,840)	\$1,762,375	\$2,300,505	\$2,799,587	\$6,714,627	\$5,458,933
ROI						408%
Payback						<6 months

Appendix A: Total Economic Impact

Total Economic Impact is a methodology developed by Forrester Research that enhances a company's technology decision-making processes and assists vendors in communicating the value proposition of their products and services to clients. The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders.

TOTAL ECONOMIC IMPACT APPROACH

Benefits represent the value delivered to the business by the product. The TEI methodology places equal weight on the measure of benefits and the measure of costs, allowing for a full examination of the effect of the technology on the entire organization.

Costs consider all expenses necessary to deliver the proposed value, or benefits, of the product. The cost category within TEI captures incremental costs over the existing environment for ongoing costs associated with the solution.

Flexibility represents the strategic value that can be obtained for some future additional investment building on top of the initial investment already made. Having the ability to capture that benefit has a PV that can be estimated.

Risks measure the uncertainty of benefit and cost estimates given: 1) the likelihood that estimates will meet original projections and 2) the likelihood that estimates will be tracked over time. TEI risk factors are based on "triangular distribution."

The initial investment column contains costs incurred at "time 0" or at the beginning of Year 1 that are not discounted. All other cash flows are discounted using the discount rate at the end of the year. PV calculations are calculated for each total cost and benefit estimate. NPV calculations in the summary tables are the sum of the initial investment and the discounted cash flows in each year. Sums and present value calculations of the Total Benefits, Total Costs, and Cash Flow tables may not exactly add up, as some rounding may occur.



PRESENT VALUE (PV)

The present or current value of (discounted) cost and benefit estimates given at an interest rate (the discount rate). The PV of costs and benefits feed into the total NPV of cash flows.



NET PRESENT VALUE (NPV)

The present or current value of (discounted) future net cash flows given an interest rate (the discount rate). A positive project NPV normally indicates that the investment should be made, unless other projects have higher NPVs.



RETURN ON INVESTMENT (ROI)

A project's expected return in percentage terms. ROI is calculated by dividing net benefits (benefits less costs) by costs.



DISCOUNT RATE

The interest rate used in cash flow analysis to take into account the time value of money. Organizations typically use discount rates between 8% and 16%.



PAYBACK PERIOD

The breakeven point for an investment. This is the point in time at which net benefits (benefits minus costs) equal initial investment or cost.

Appendix B: Endnotes

¹ Total Economic Impact is a methodology developed by Forrester Research that enhances a company's technology decision-making processes and assists vendors in communicating the value proposition of their products and services to clients. The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders.

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