

# Business Intelligence on the Cloud: Overview and Use Cases

The use of Business Intelligence (BI) in the cloud is a game-changer, as it makes BI affordable and easily available as compared to traditional BI. It is expected that customers will slowly but surely migrate from in-house BI to BI in the cloud. Cloud Computing was a big topic of discussion in the early part of 2010 and many vendors developed strategies and solutions around Cloud BI in 2011. Customers are expected to continue their shift to the cloud in 2012, helped in part by big vendors enabling their traditional BI solutions as a cloud offering in an attempt to capture more of the mid-size market. Vendors are expected to further strengthen their cloud BI offerings and refine the migration approach to promote better adoption.

This paper touches upon the drivers and challenges related to Cloud BI, and can act as a source of information related to leading Cloud BI vendors. It also covers a few sample use cases and recommended solutions for each scenario.

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## List of Abbreviations

<b>BI</b>	<b>Business Intelligence</b>
<b>BIPM</b>	<b>Business Intelligence and Performance Management</b>
<b>Capex</b>	<b>Capital expenditure</b>
<b>DBMS</b>	<b>Database Management System</b>
<b>DW</b>	<b>Data Warehouse</b>
<b>ETL</b>	<b>Extract, transform and load</b>
<b>IaaS</b>	<b>Infrastructure-as-a-Service</b>
<b>IRR</b>	<b>Internal Rate of Return</b>
<b>NPV</b>	<b>Net Present Value</b>
<b>Opex</b>	<b>Operational expenditure</b>
<b>PaaS</b>	<b>Platform-as-a-Service</b>
<b>RoI</b>	<b>Return on Investment</b>
<b>SaaS</b>	<b>Software-as-a-Service</b>
<b>SI</b>	<b>Systems Integrators</b>
<b>SLA</b>	<b>Service Level Agreement</b>
<b>SMB</b>	<b>Small and Medium Businesses</b>

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## Introduction

Business Intelligence (BI) on the Cloud is a delivery model that is slowly catching up and an area that is being actively watched by many. Although it is not expected that customers will rapidly replace their on-premise BI solutions in favor of Cloud BI options, it is observed that there are a few, legitimate use cases where the Cloud BI model would be beneficial and worth consideration.

This paper touches upon the primary drivers for Cloud BI as well as the main challenges and concerns around it. It further delves on a Return on Investment (RoI) calculator designed to aid a customer to calculate the long term savings of moving to a cloud model as against an on-premise solution. Finally the paper touches upon the Cloud BI product landscape and the leading vendors in this space in the current date, along with a few use cases where the Cloud BI model could be considered.

## Introduction to Cloud BI

Cloud deployment strategies are often categorized either as Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), or Software-as-a-Service (SaaS).

- IaaS typically provides managed networking, servers, storage, platform virtualization, and operating system environments.
- PaaS builds on IaaS to further include managed middleware, such as application servers, database management systems, data integration services, BI development services, etc.
- SaaS extends this stack to also incorporate the application layer.

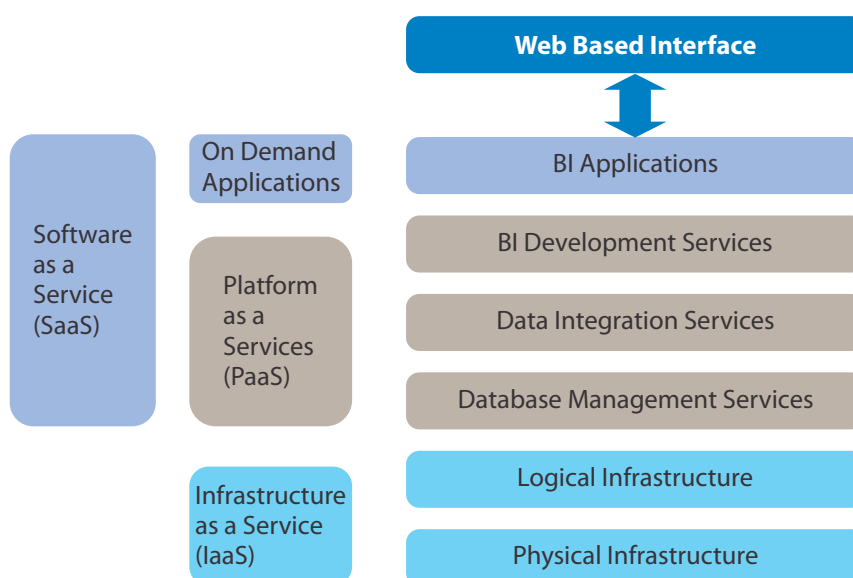


Figure 1: Cloud BI Models

In the current scenario, the adoption of cloud BI has been observed in the following categories:

1. **Small and Medium Businesses (SMBs):** Used as a horizontal BI tool to deliver standalone, internally facing reporting and analysis applications, with a traditional relational database (or data mart) as the primary source data system.
2. **Large Enterprises:** Used as a horizontal tool to provide a simple, distinct, affordable IT sandbox where project experimentation and evaluation can occur far from a production environment.
3. **Systems Integrators (Sis):** Used as an application framework or pre-built reporting and analysis template for assembling customer-specific functional or domain solutions more quickly. These contain reusable components and application logic that can be tailored to specific needs.

## **Business Intelligence on the Cloud: Drivers**

There are several operational and financial factors that work in favor of Cloud Business Intelligence (BI), the key being:

- **Speed of Implementation and Deployment:** Immediate availability of environment without any dependence on the long periods associated with infrastructure procurement, application deployment, etc. drastically reduces the BI implementation time window.
- **Elasticity:** Leverage the massive computing power available on the Web, scale up and scale down based on changing requirements.
- **Focus on Core Strength:** Outsource running of BI apps to professionals and focus on their core capabilities.
- **Lower Total Cost of Ownership:** Convert some part of capital expenditure (capex) to operational expenditure (opex), cost-effective pricing models, pay per use model, etc.
- **On-demand Availability:** Support mobile and remote users, Browser-based access to control everything from the cloud platform to database management, from the data warehouse layer to the analytics platform.

## **BI On the Cloud: Concerns**

There are also many inhibitors which have resulted in a very slow adoption rate to Cloud BI so far. A few common and leading concerns are mentioned here, along with recommendations on addressing the concerns:

- **Data Security:** Security concerns including confidentiality, integrity and availability of the data continues as the top concern for utilizing the Cloud. For some organizations, the concerns over security may be a barrier that is impossible to overcome today. However, as more organizations move

to the Cloud it is expected that the concerns will lessen. In many cases, the Cloud vendors provide a more secure environment than what exists at customer sites.

- On premise Integration: Sudden movement to cloud is not feasible and a phased approach is usually recommended. There will be a co-existence model until the cloud BI market is more mature.
- Lack of control: Tough to get Service Level Agreements (SLAs) from cloud providers. Data control and data ownership, reliability of service challenges are some of the main reasons for client concern. To mitigate this, organizations should already have in place thorough IT governance and service delivery standards and models.
- Vendor Maturity: Too many cloud BI vendors, hosting providers with varying offerings, etc. makes it confusing to choose the right vendor based on required needs and vendor capabilities.
- Performance: Limits to the size and performance of data warehouses in the Cloud, significant latency if BI applications exist in the Cloud but the data exists at a client site, especially when processing and returning large amounts of data.
- Pricing models: Lack of standardized pricing models makes it difficult for customers to select the right one

## Cloud BI Options

The following options list the basic models by which BI can be deployed on the cloud:

- Public cloud-based IaaS for a BI system
- This option involves subscribing to an IaaS vendor such as Savvis, Amazon, Rackspace or GoGrid and a pay-as-you-use model on hardware and systems software. Companies can then buy and deploy their own ETL, DBMS and BI software on top of this. There may be some limitations by the vendors on what it will maintain in terms of the BI/Data Warehouse (DW) infrastructure.
- BI/DW Platform as a Service (PaaS)
- This option involves deploying the BI/DW system on a public cloud or an externally hosted BI/DW for building one's own cloud-based BI system. Sample product vendors in this area are—AsterData MPP on Amazon EC2, IBM Cognos Express on Amazon EC2, Teradata Express on Amazon EC2 and RightScale/ Talend/Vertica/Jaspersoft on Amazon EC2. Sample use cases where this option can be considered are BI systems for SMBs, Custom Analytic applications, Enterprise BI systems, Data Mining, Prototyping, short-lived BI projects, etc.

There are two options of vendors here:

- a. Multi-vendor DW/BI PaaS: An example of a multi-vendor option is the RightScale/ Talend/Vertica/Jaspersoft PaaS offering on Amazon EC2. In this offering, data integration is very much file based, such that one can upload files of data and then there is some processing

of that data to load it into the PaaS DW/BI database. Several single-vendor PaaS offerings give only fairly lightweight data integration once data is uploaded and not full blown ETL with built-in data quality that might be used to in a data centre.

- b. Single: A single vendor PaaS offering would be GoodData, SAP Business Objects On-Demand, Birst, Indicee, PivotLink, etc. In this space there are vendors such as GoodData that provide pre-built integration with cloud-based data integration tools such as Informatica cloud, SnapLogic and Boomi. Thus one can use these tools to integrate data before passing the data sets to them. Another alternative is to perform a major part of the data integration in-house before uploading data files.

- **Analytics on the Cloud**

Vendors in this space include many relatively new vendors (for example, Cloud9 Analytics, Rosslyn Analytics, Lixto) as well as traditional mainstream vendors, for example, SAS, IBM Cognos. These vendors provide pre-built solutions

- **Public cloud or externally hosted SaaS BI for operational reporting on cloud-based operational data**

This option involves using a cloud-based reporting system on operational data typically from a cloud-based transaction processing system such as Salesforce.com. For example, SAP BusinessObjects CrystalReports.com for Salesforce.

- **Private cloud-based BI system running internally**

The largest private cloud-based BI system is IBM's internal Blue Insight which is based on IBM System Z and IBM Cognos 8 BI. IBM has also launched the Smart Analytics Cloud, a private cloud offering for large enterprises based on the same technologies.

## **ROI for a Cloud BI Implementation**

For a given use of money in an enterprise, the RoI (return on investment) is how much profit or cost saving is realized. We need to analyze and predict the RoI for any implementation to understand if the implementation will be beneficial for the organization.

When an organization plans to move to a Cloud BI solution or a Hybrid solution, they need to compare the expected RoI of this solution with the RoI of a pure on-premise implementation. (Hybrid solution is where some components of the BI stack are moved to the cloud, keeping the rest on premise) This will help in making the decision on what components of BI should be moved to the cloud for the most beneficial scenario.



## Rol Metrics

Business Benefits can be categorized as:

- Financial Benefits: Include impacts on the organization's budget and finances, for example, cost reductions or revenue increases
- Non-financial Benefits: Include impacts on operations or mission performance and results, for example, improved customer satisfaction, better information, shorter cycle-time.

### Financial Rol

The following three metrics are the key measures of the Financial Rol of an organization.

- Payback Period: The amount of time required for the benefits to pay back the cost of the project. This does not take into account discounted cashflows.
- Net Present Value (NPV): The value of future benefits restated in terms of today's money.
- Internal Rate of Return (IRR): The benefits restated as an interest rate.

### Non Financial Rol

These are the intangible benefits of a BI implementation.

Some of the 'non-financial' metrics can be:

- Customer Satisfaction Index (CSI)
- Ratings by Independent agencies
- Better time utilization by business and IT users
- Quality Data for Downstream/Upstream applications
- Public relations
- Risk avoidance
- Greater confidence in the decision making process

In the following section we will focus on the calculation of three Financial Rol metrics:

To calculate the metrics, we first need to list down the cashflows of the organization. This includes Cost and Returns.

Cost and Returns are estimated for x years where x is the life of BI implementation in number of years. Generally the life span where a BI implementation brings benefit is: 3 to 5 years.

## ■ Cost

The Cost for a BI implementation can have two components:

- Capital Expense (Capex): For example, one time hardware cost, software license procurement, software services cost for Implementation, etc.
- Operational Expense(Opex): For example, support services cost, Annual Maintenance Contract for software, hardware

## ■ Returns

The benefits achieved from the BI implementation are of two types:

- Savings: For example, time saving for data consolidation, time saving for data fixing.
- Revenue: For example, earnings due to marketing campaigns derived exclusively from the DW.

Once we know the cashflows, the RoI metrics can be calculated. The following example shows the calculation fore these metrics.

Discount Rate  
10

Cumulative value  
1.1

Year	Expected Cash Flow	Inflow/Outflow	Denominator	Discounted Cash Flow Value
Year-1	(\$3,000)	Outflow	1.1	(\$2,727.27)
Year-2	\$2,000	Inflow	1.21	\$1,652.89
Year-3	\$2,000	Inflow	1.331	\$1,502.63
Year-4	\$2,000	Inflow	1.4641	\$1,366.03
Year-5	\$2,000	Inflow	1.61051	\$1,241.84
Year-6	\$2,000	Inflow	1.771561	\$1,128.95
Total				\$4,165.07

NPV (with discount rate - 10%)

\$4,165.07

IRR

60%

Payback

Period

Payback Period is calculated as the time duration when total expenses (outflow) has been compensated by the revenue earned (inflow) by the new implementation  
In this example, expense 1500 are recovered in 1 year (1000) plus half year (1000/2) = 1.5 years. Hence payback period = 1.5 years

**Figure 2: RoI Calculation Metrics**

## Comparison of on-premise and Cloud-based RoI

Though the process for calculating the RoI remains the same in on-premise and cloud/hybrid implementations, the cost and returns will vary. Here are some of the factors which will be different.

1. Hardware cost: For cloud components, there will be no hardware cost required for production servers. Organization may still have to buy development servers; this cost will have to be considered. Also, in a hybrid system, the cost of production servers will be zero for components on cloud but for on-premise components it will remain the same.

2. **Software License Cost:** The license cost will be different for both the solutions. The cloud cost will be based on factors such as number of users and specific features required. This needs to be considered separately. In a hybrid system, the cost of licenses will be considered separately for on-premise and cloud components.
3. **IT Services Cost:** IT implementation skills required for cloud-based applications may be different, hence effort can be different
4. **Support cost:** In cloud-based solution, primary support of application will be provided by the cloud vendor. This cost will not be required in cloud application.
5. **Upgrade:** Generally within a span of BI implementation (typically 3 to 5 years), there will be at least one software upgrade required. This cost will come as Opex in an on-premise solution, but will not be required in cloud solution as this is handled by cloud vendor.

Based on the above differences, the RoI metrics can be calculated for cloud and on-premise solutions. The value of the three metrics will help in deciding which is a better cost effective solution for a given problem statement.

Given here is a sample out of the RoI calculator.

Cashflow Calculation Worksheet	On Premise						vs. On cloud/Hybrid					
Cost Component	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Outflow												
Capex-Hardware	140270	122	122	122	0	0	30270	57	57	57	0	0
Capex-Software	251	56	56	56	0	0	251	56	56	56	0	0
Capex-Cloud Licenses	0	0	0	0	0	0	66000	66000	66000	66000	0	0
Capex-IT Services	100	0	0	0	0	0	30	4	4	4	0	0
Opex-AMC (Annual Maintenance Contract) for TCO period	225	5	5	5	0	0	225	5	5	5	0	0
AMC-Hardware for TCO Period	63	3	3	3	0	0	40	0	0	0	0	0
AMC-Hardware for TCO Period	128	0	0	0	0	0	128	0	0	0	0	0
Total outflow	141037	186	186	186	0	0	96944	66122	66122	66122	0	0
Inflow												
Savings	190	102000	102000	102000	0	0	6140	157000	157000	157000	0	0
Revenue	40	0	0	0	0	0	40	0	0	0	0	0
Total Inflow	230	102000	102000	102000	0	0	6180	157000	157000	157000	0	0
Cashflow	-140807	101814	101814	101814	0	0	-90764	90878	90878	90878	0	0

ROI Metrics	Formula	Value (in Years)	
		Cloud	On Premise
Payback Period	No of years when Total Inflow = Total Outflow	0.99	1.4
Net Present Value (NPV)	The value of future benefits restated in terms of today's money	\$122,941.94	\$102,172.14
Internal Rate of Return (IRR)	The benefits restated as an interest rate.	84%	13%

**Figure 3: Sample RoI Calculator**

## Cloud BI Product Landscape

There are many options, both from traditional BI vendors and from newcomers, providing different BI functionality based on different architectures and platforms. The following figure and table lists the major vendors offering Cloud BI solutions.

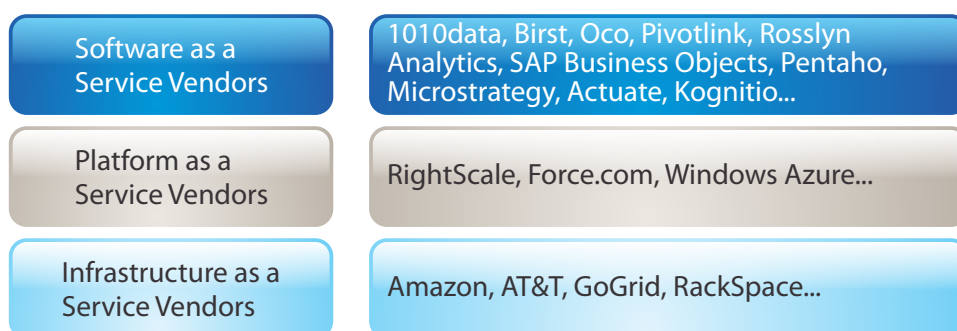


Figure 4: Cloud BI Product Landscape

Architecture and platform	Representative vendors
SaaS BI Solutions	Adaptive Planning, Analytix On Demand, Birst, BlinkLogic, GoodData, HostAnalytics, Indicee, LiteBI, Oco, PivotLink BI, SAP Business Objects on Demand
BI/DW Platform as a Service (PaaS)	AsterData MPP on Amazon EC2 IBM Cognos Express on Amazon EC2 Teradata Express on Amazon EC2 RightScale/ Talend/Vertica/Jaspersoft on Amazon EC2
Traditional BI hosted	Actuate, IBM Cognos, Information Builders, Jaspersoft, Kognitio, MicroStrategy, Oracle, Panorama Software, Pentaho, QlikView, SAS Institute, TIBCO Spotfire
SaaS BI Packaged Analytic Application Solutions	Cloud9 Analytics, IBM Cognos Analytic Applications, PivotLink, Rosslyn Analytics, SAS, SAP BusinessObjects BI On-demand for Salesforce
Cloud Based Data Integration Tools	IBM Infosphere DataStage, IBM CastIron, Informatica Powercenter Cloud Edition, Snaplogic Dataflow, Talend Integration Suite on RightScale Managed Platform

## Cloud BI Use Cases

Use Case	Analysis	Recommended Solution
Coexistence case: SaaS BI application for transactions along with on-premises BI solution. For example, Salesforce used for sales and marketing.	SaaS BI application data needs to be brought into the enterprise data warehouse for integrated information analysis. Using on premise integration solutions to extract cloud-based application data has its challenges.	ETL on Cloud
SaaS centric Enterprises: Organizations are moving many of their key systems to cloud. For example, CRM, HR, ERP	CRM, HR, ERP are some of the key sources for any BI application. If the sources are moving to cloud, it makes sense to store the integrated information to the cloud as well.	SaaS BI DW on Cloud
Small mid-sized business enterprises: Organizations which are growing from very small business to middle size, or expanding location from one to two/three.	Such organizations, need a BI system but will not like to spend on their own fully functional BI systems	SaaS BI model
Elasticity Requirements: Companies with strong variation in transactional data periodically. For example, high data activity when analysis required for yearend data, or high transaction volumes in Point-of-Sales in the peak festival season.	The Customer will not like to maintain a high capacity warehouse for the whole year. There is a need to provide flexibility in paying for only the used capacity.	DW on Cloud Analytics on Cloud
Consolidation Scenario: Organizations with multiple departments working in silos, each having its own BI system	Multiple BI tools, servers may coexist, with each not being used to the fullest of capacity.  Need for an integrated/consolidated BI system which is available enterprise wide. The server capacity and user licenses can be shared among the departments for better utilization of costs incurred in BI systems.	Private Cloud

## Conclusion

Cloud is a big part of future Business Intelligence and offers several advantages in terms of cost benefits, flexibility of implementation, availability and speed of implementation. It is very relevant to BI/DW implementations as typical BI/DW applications demand high infrastructure requirements, handle unpredictable load volumes, involve high upfront investment, high development and maintenance costs, takes a longer duration for provisioning and has so far displayed a high reliance on IT.

Although initially cloud-based solutions were designed for small- to mid-size companies that did not have available IT resources or capital to spend on creating and managing a software and hardware infrastructure, today, many large companies are investigating the cloud as a way to add new business solutions quickly and augment existing data center capacity.

While considering Cloud BI, organizations are recommended to follow a few risk mitigation steps and strategies:

- Perform due diligence for security, backup, and disaster recovery: Check whether the BI SaaS provider complies with emerging SaaS standards such as the SAS 70 Type II audit.
- Thoroughly understand the BI SaaS pricing and contract matters: Understand the various pricing models offering by the vendor and choose the one that is definitely needed, study the service-level agreements (SLAs) agreed upon by the vendor and keep track of actual application usage.
- Evaluate true long-term total costs of ownership: Perform a detailed RoI calculation to calculate long-term total ownership costs based on the specific environment and requirements.
- Double-check whether any additional source data licenses are needed: Understand if any additional licenses need to be procured for other enterprise applications that the SaaS BI application would need to interface with.
- Plan for the worst: Have a detailed cloud to on-premise migration strategy in place in case the Cloud Vendor fails to perform according to desired expectations.

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