



## PERVASIVE ANALYTICS – THE KEY TO THE FUTURE

Analytics, like technology, should be democratized to the extent possible in order to ensure that organizations are data-driven in their decision-making processes. It means that a specific department cannot service the entire spectrum of analytics needs of the organization, which is deemed to be neither sustainable nor scalable. In turn, it will only become a hurdle to analytics being used extensively across the organization in an era where organizations' ability to stay competitive is largely dependent on how they leverage data and analytics in making informed business decisions.



## Features of smart organizations

A smart organization will be defined by the extent to which it uses data available in the ecosystem it operates in to make informed decisions, and in turn how mature its analytics capabilities are.

Today, static data structures that constrain analytics and decision-making are already a thing of the past! In the future, analytics will feature the following:

- **Pervasive analytics and Chief Analytics Officers (CAOs):** These are bound to become certainties in any company that falls into the smart organization definition. Every CAO will lead an analytics CoE (Center of Excellence), driving and facilitating analytics in the organization
- **Analytics in descriptive, diagnostic, predictive, and prescriptive forms:** Based on the business operation level, decision to be supported, and the data availability; analytics complexity will vary. But, all forms will exist within the enterprise
- **Self-service:** Decision-makers will not depend on assistants and analysts to do all analysis. Instead, dashboards that are interactive, allowing business users to execute drill-downs easily, and embedded into workflows will gain popularity. In fact, even statistical analysis will have business-friendly user interfaces, so that a marketer, for example, can implement segmentation without statistical help
- **Precise insights:** Just like a search engine makes the internet navigable by allowing us to quickly narrow in on what we need from vast online resources, analytics will also be structured similarly using intelligent exception management systems that control interactions with business decision-makers so that the large extent of available data (internal and external) is precisely distilled to provide decision support without swamping the decision-maker with 'insights'
- **Employees will expect a responsive enterprise:** A responsive enterprise is one that knows and anticipates the needs of the user at any given instance and is able to respond to these needs by mining a wealth of information that is available across the enterprise and outside. Taking a cue from the experiential aspects of interactions with technology in personal lives, the usability of mobile devices, websites, and social networks, enterprise systems will also become more intuitive and naturally blended with the user in the experience they provide
- **Streaming data analysis and real-time intelligent decision-making:** These will become a hygiene-requirement. The reaction time to an unearthed fact should not be so long that the fact loses relevance with the insights presented. Predictive analytics that provide before-time-insights will play a crucial role in enabling decisions, while real-time analytics will bring in real-time corrections to the decisions in hand
- **Machine learning and knowledge discovery:** These will see increased adoption to allow analytics to leap beyond human limitations of users. The users' imagination will not constrain the patterns that can be identified and used for prediction and hence for decision-making. Unsupervised is the technical term; increasingly firms are looking to use unsupervised techniques to unearth nuggets of information that help in predicting future events



These features of analytics in the future were also visible at the times of advent of big data and unstructured data analytics. However, investment challenges and resistance to change have meant that some organizations will progress to this future state gradually, while others will leapfrog and derive accelerated benefits from the same.

## Current state of analytics in industry

Today advanced analytics is operational in the following three forms across business organizations:

- Analytics embedded into systems and processes: For example, organizations using Oracle's Demantra to forecast insights are using multiple models and auto-selecting the most effective one for various demand categories. Demantra is often integrated with Oracle's E-Business Suite R12 for forecasts to be utilized in business processes

- Advanced Analytics to answer critical business questions: For example, when a leading, Midwestern US department store wanted to know whether moving into the furniture business had affected other category sales unfavorably and to what extent, they turned to analytics to arrive at the answer

- Advanced analytics for data discovery: For example, pattern identification allowed a retailer's data to be analyzed to forecast errors, thus enabling better exception management in forecasts for ordering, etc. Certain repeat patterns in the demand signals were indicative of oncoming variance between forecast and actual values

Analytics paradigm	Example	Data	Business user actions	Analysis
Current	Price elasticity using demand and price points / indexing / attributes	<ul style="list-style-type: none"> <li>Crystalline</li> <li>Structured</li> <li>Stable</li> </ul>	Leverage elasticity for what-if analysis	Descriptive
Forward looking	Intelligent pricing using elasticity after evaluating competitor data and reaction, channel data, and supplier media activity	<ul style="list-style-type: none"> <li>Structured and unstructured</li> <li>Amorphous</li> <li>High velocity, complexity, and volume</li> </ul>	View and approve price changes by exception	Predictive
Futuristic	Investigate what affects elasticity itself, using DSR (demand signal repositories). Multiple sources of potential causal factors such as inventory, weather, square feet, adjacency, store associates, parking availability, free-way access, queue levels, etc. Assess impact on price amongst other factors after estimating competitor reaction to favorably move demand and margins	Exponential change in volume and variety	View and approve price changes by exception	Predictive and non-linear – high use of machine learning

Organizations are at different levels of maturity in the context of readiness to adopt various levels of analytics. Most of them use advanced analytics in critical areas such as cross-selling, pricing, and forecasting, but not in other sectors. Thankfully, this is quickly changing! In some industries, companies are embedding advanced analytics into their decision-making processes, especially in areas such as fault identification, fraud analytics, marketing, and e-business. In fact, some are experimenting with advanced analytics through low-cost-trials that typically leverage cloud and analytics-as-a-service.

A few others still use advanced analytics for pattern identification and knowledge-discovery from data.

The analytics done by individual decision-makers is still largely descriptive. This needs to evolve into self-service so that decision-makers are able to perform descriptive analysis. However, business users are seeing trends and extrapolations in MS Excel today, which is a form of predictive analytics. This should evolve into self-service as well, where business users can run a propensity model, for example, to see which types of customers are likely to respond to new promotions. When users select a date

range that is statistically insufficient, the tool should provide error and guidance mechanisms that will alert the user to an incorrect selection with messages such as 'Period selected is too short. Please select a period longer than 3x where x is the period for which propensity prediction is needed.'

The progress of analytics will differ across organizations based on their current maturity and selection of one of two paradigms – business users focusing on analytics are unable to concentrate on their main role, or business users focusing on analytics are gaining deeper insights for their main job.



## Analytics maturity

There are two primary maturity journeys that organizations undertake in the context of analytics: One is in terms of the depth of analysis, while the other is the model of engagement they adopt with 'Who does the analytics?'

During the adoption of advanced levels of analytics, many organizations are

anxious about their readiness – will the teams tie themselves into knots with the rope of analytics rather than build a ladder? In other words, business leaders' acknowledge the logic of analytics for intelligent decision-making, but hesitate before trying advanced analytics or enabling self-service analytics for users.

Their hesitation is understandable, because without the correct approach, analytics can be extremely misleading. At the very least, it fails to provide business benefits and is relegated to something that is being leveraged on the surface while decision-makers still primarily use their instinct like they always have.

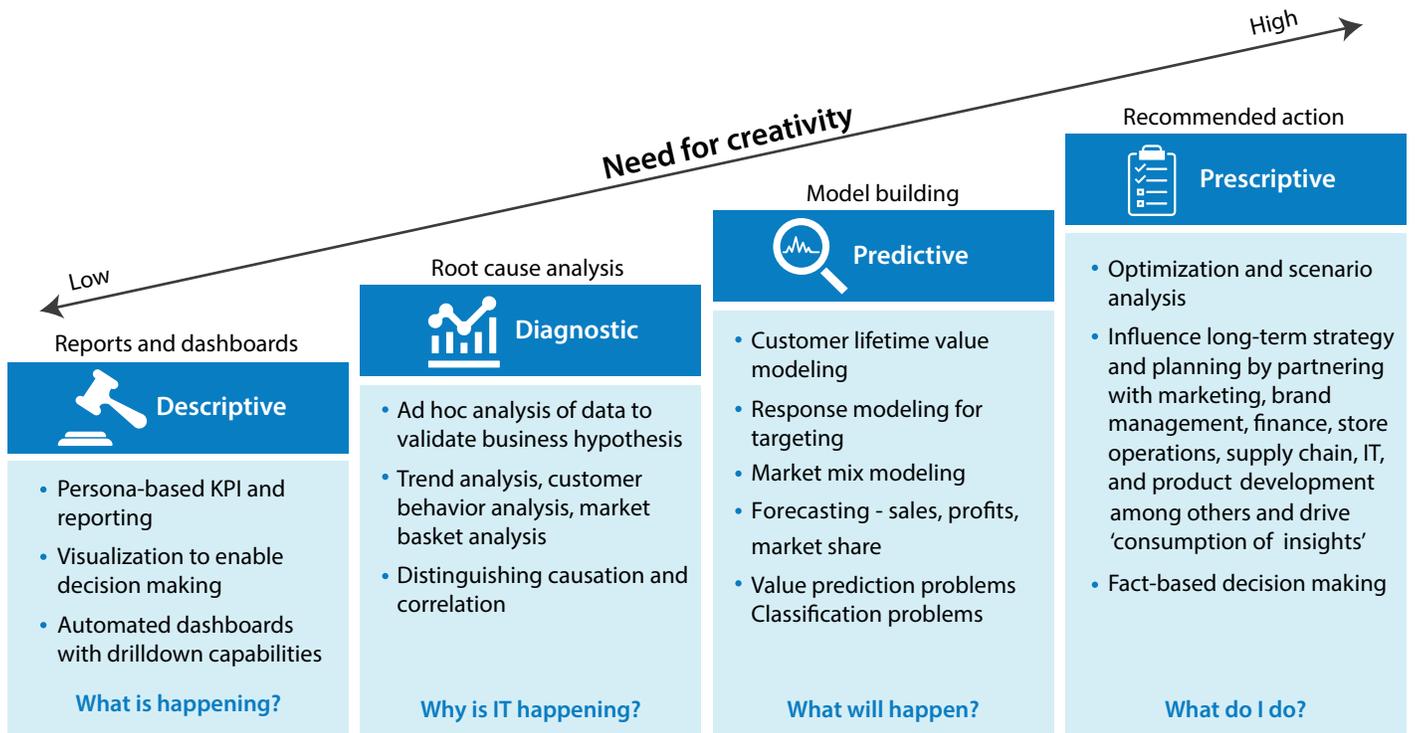


Figure 1: Forms of analytics

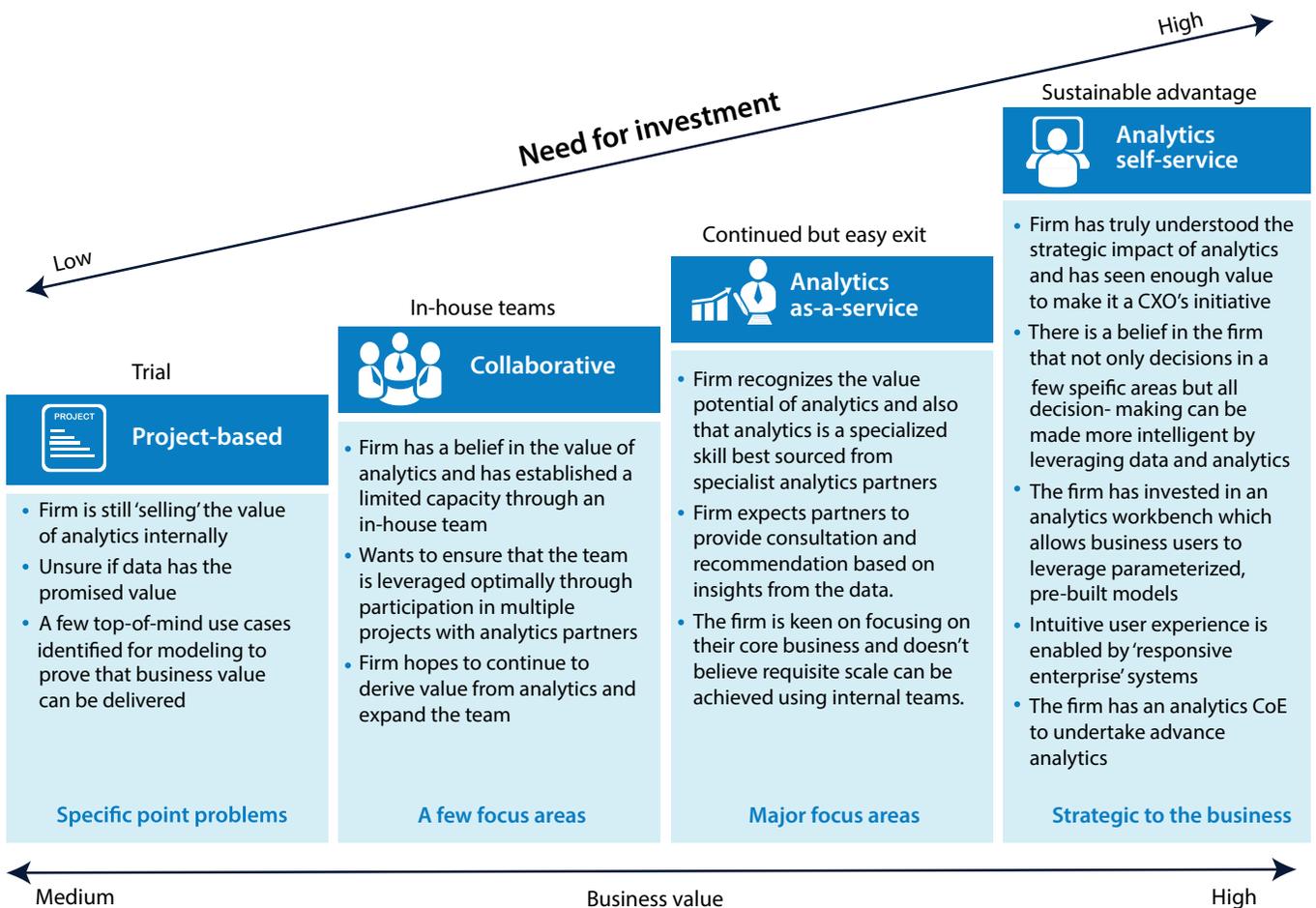


Figure 2: Maturity in analytics-models

To derive a sustainable advantage, the firm needs to make strategic investments in analytics. The journey towards that realization and readiness is depicted in the previous page. The journey is not so much about internal processes or system changes as it is about the habit of decision-makers to use analysis for their decisions.

For example, for a retail leader, setting up

an analytics workbench is an investment option that has to prove its ROI over opening a few more stores for market penetration or packaging plant for private label products. It can, therefore, be expected that most business leaders will seek a journey towards strategic investment in enterprise scale analytics rather than a big-bang approach. Hence, a roadmap that focuses on cashing in on

low-hanging fruits that are self-sustaining is an essential aspect of any analytics strategy.

Therefore, analytics will have to prove itself to be worthy of the risk that projects can stall or become dormant. It is a powerful tool but one must know how to leverage fully, or else it can cause more harm than good.

## Challenges that block analytics initiatives:

While the most significant hurdle faced today is in data readiness, we shall not focus on that aspect in this section. We will also not discuss significant hurdles in organizational readiness to leverage insights from analytics. Rather, we will focus upon the core problems for failed analytics initiatives which include:

- Poor quality of insights that occurs when the correct confluence of technology, mathematics, and business acumen is not achieved
- Incorrect business strategies that occur when decision-makers depend only on central or outsourced analytics teams, instead of owning self-service tools

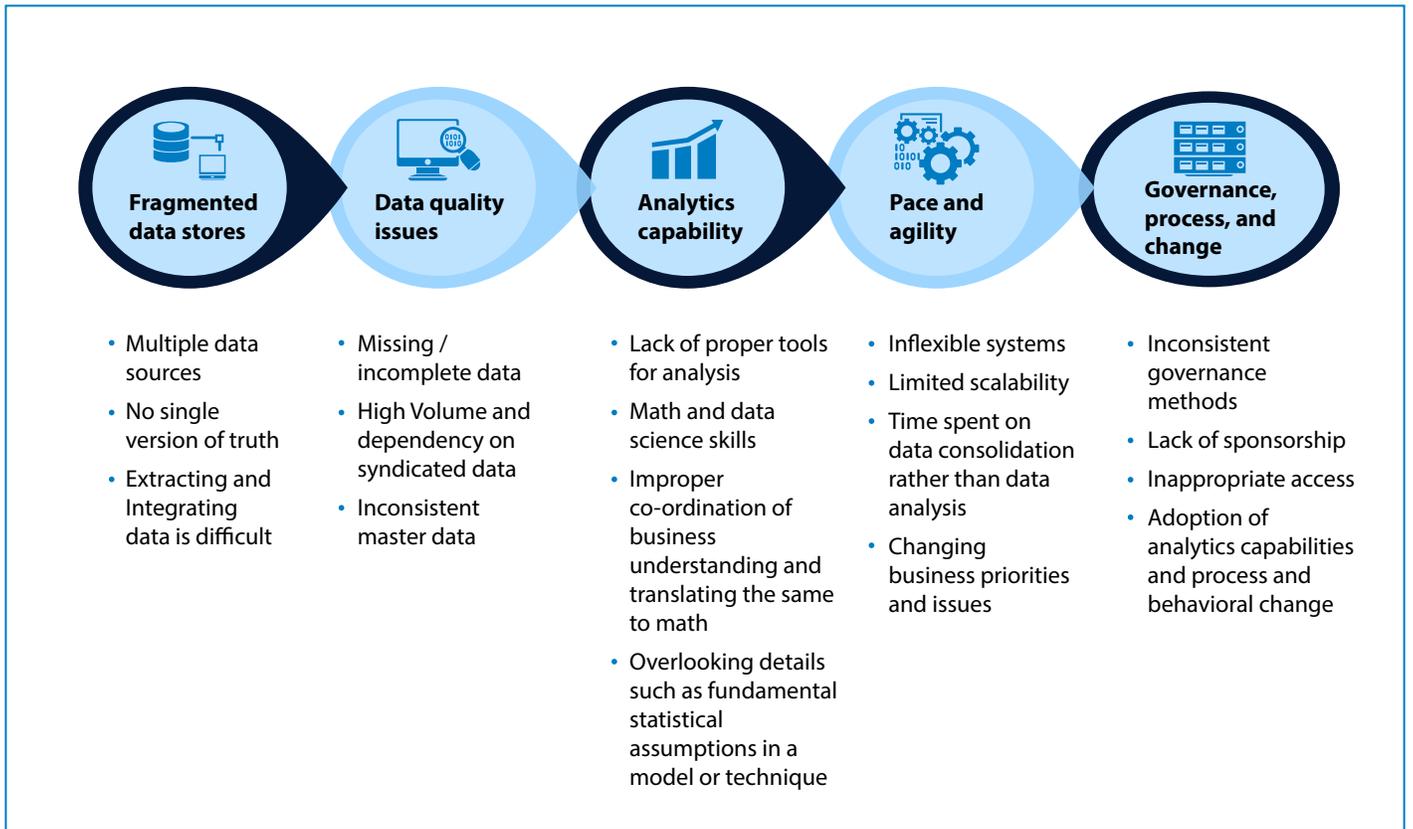


Figure 3: Challenges blocking analytics initiatives

Navigating around these pitfalls is key to having a successful data monetization experience. Organizations cannot afford errors caused by misalignment of technology, business, and mathematics.

Extremely complex models make 'debugging' of an analysis excruciatingly difficult. A given input will typically produce an output, but the applicability of the same will depend on the validity

of the statistics behind the model in the particular business situation, and judging that depends on the skill and knowledge of the data scientist / analyst.





## Technology

Technology may cause a problem by way of constraints. For example, many retailers continue to cluster their stores where the number of clusters is a user input, rather

than the natural number of clusters being derived from the data. This typically occurs because of a tool limitation. The same could be mitigated by an astute statistician

by running multiple clustering instances. However, tools that have this built-in obviously provide an advantage.



## Statistical assumptions

Models obviously operate with certain fundamental statistical assumptions. For example, k-means clustering treats all numeric columns as continuous variables. If a factor being used in this clustering is not a continuous variable, k-means may not be the right technique to use.

With large data sets, these mistakes become more common. Especially for 'citizen' data scientists, the analytics workbench has to be intelligent to point out errors in input data or parameters because business decision-makers are likely to have less than sufficient statistical

knowledge. The beauty of a self-service analytics workbench is when it guides the user with workflow and messages such as 'churn analysis will need a longer observation period, since average re-purchase period is seen to be x months.'



## Business acumen

Business acumen is, of course, of foremost importance in advanced analytics for business decisions. As an example, a promotion ROI model that ignores a pull-forward effect will be erroneous.

For many non-perishable items, a promotion only advances demand, i.e., later sales will decline to compensate for the promotion lift. This effect reduces with increasing perishability and increasing

impulsive nature of the item. A pull-forward effect for potato chips would be less than tins of cashew, for example.



## Inability to leverage big data

Many organizations want to leverage big data for decision-making but do not understand what that truly means. The implicit aspects of flexible data structures, self-learning analytics, data

discovery, pre-processed analytics for real-time decision support, advanced 'noise-cancellation', and so on, are not well understood by many. The ability to plan and provide all these will come from a

few organizations that have the necessary business understanding, statistical analytics, analytics technology, and data management skills.



## Absence of a roadmap

With analytics being discussed in the market today around the buzzwords of big data and predictive analytics, we believe the difference will be brought about by those organizations that not only provide big-data-based analytics, but equally avoid the overload this can create and provide the distillation required for this to be usable to businesses. Absence of a plan on how to prioritize, automate, manage exceptions, and make the insights usable will soon be seen to be the biggest lacunae in a big data analytics plan.

It is natural that the analytics needed as well as the exception management, prioritization, etc., will be different, based on user job functions and roles. Learning from past selections that the user has made also allows the system to prioritize efficiently for the user and this improves over time. A key aspect of a responsive enterprise is the ability to contextualize the user experience based on the role, the time of month, events occurred, alerts, and past behavior of this, or similar users. The mass of insights possible will only be leveraged

in a productive manner when enterprise systems become one-with-the-user. In ancient days, for a swordsman, the sword was an extension of the body, termed as *sentient de fer*. This was used later in automobile engineering – the automobile being an extension of the driver's self, termed *sentient d'auto*. We are now in a world where technology is expected to be intuitive and naturally consumable by us to the extent that the technology we use is a part of ourselves; we are in the age of *sentient de tech*.



## The proposition

With self-service analytics, the mathematics is built into the pre-built model and workflow, the technology is embodied in the platform and its integrations, and the business acumen is expected from the business user or decision-maker.

Organizations that are able to leverage advanced analytics are those who can enable a confluence of math and analytics, technology, and business acumen, and sustain this at the required scale. Such sustenance requires the enterprise's analytical capability to be relevant to most of their decision-makers. For instance, a manager of online business will not use data for decisions unless social and mobile data are encompassed; a marketing manager will not use data for decisions unless he can achieve segmentation by a myriad of factors that change almost every month, etc.

Companies, therefore, need to adopt boundaryless data platforms and a progressive organization structure

and culture – to truly become smart organizations. Business leaders will value internal and external partners who can provide pervasive analytics in the following manner:

1. Focus on decision sciences rather than just data sciences, i.e., not just insights from data but decisions from data.
2. Provide analytics (and not simply reporting) on an industrial scale
3. Provide ways to make the exponential growth in analytics manageable by
  - a. Embedding into processes
  - b. Extending into optimization rather than just analytics and
  - c. Enabling intelligent self-service, responsive and intuitive analytic systems, and exception management
4. Provide self-service through visualizations and depictions that are device-independent and interactive, and also an analytics workbench that
5. Provide advanced analysis through machine learning, data mining, and data discovery to co-exist with self-service. These advanced analytics services would need to be provided by specialists and not left for business decision-makers to do themselves. Also, business decision-makers can understand results from complex models easily if they provide interfaces for automated decision recommendations and also exception approval and workflows.

## Five essentials for pervasive analytics

An organization will require the following attributes to be brought into its analytics capabilities to make it pervasive:

- **Self-service through an interactive UI for visualization and reporting:**  
Should be available over intellectual property and mobile devices as interactive screens allowing creation of personal views of relevant data

- **Analytical workbench vis-à-vis self-service analytical platforms:** It should enable business users to trigger diagnostic and predictive analytics using an analytics workbench that comes along with model configuration workflows, pre-built analytical models, and new model plug-in or refresh mechanisms

- **Responsive enterprise:**  
Understanding user behaviour and being responsive to their analytics needs across the dimensions of time, form & channel, is important, for an organization to be responsive. The right data & analytics strategy, future state technology components & architecture, and relevant governance of data availability & access will make a responsive enterprise a reality

- **Machine learning:**  
Self-learning models that can provide recommendations, based on decisions taken in the past or taken by the larger community of users. Trends and patterns that are significant and important for business decisions can be unearthed without specific questions being asked by the decision-maker as well

- **Prescriptive and optimization:**  
For most decisions in an organization to be analytics-driven, even decision-making would need to be automated to an extent. For example, a pricing analytics output can be presented as recommended prices and only those over a threshold would need exception approval. This would imply price optimization and is the last mile in making analytics pervasive

Like any other new initiative (for example, like the wave of online or mobile, that happened a decade ago), taking bold steps in analytics will generate returns.

To summarize, the winners will be the ones that leverage extreme volumes of seamless data, funnel that into analytics (including predictive analytics) to create

usable insights, and ensure timely insights by leveraging real-time or streaming data analytics as needed. These insights should be easily consumable through self-service portals, alerts, and drill-downs on mobile devices. Insights should continuously improve over time. And most importantly, the technology prowess to embed insights

for optimization and automation of transaction system outputs, thereby into the business process, is a must-have.

Data may be the new oil, but for organizations that do not watch their step, it could prove slippery as well.

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