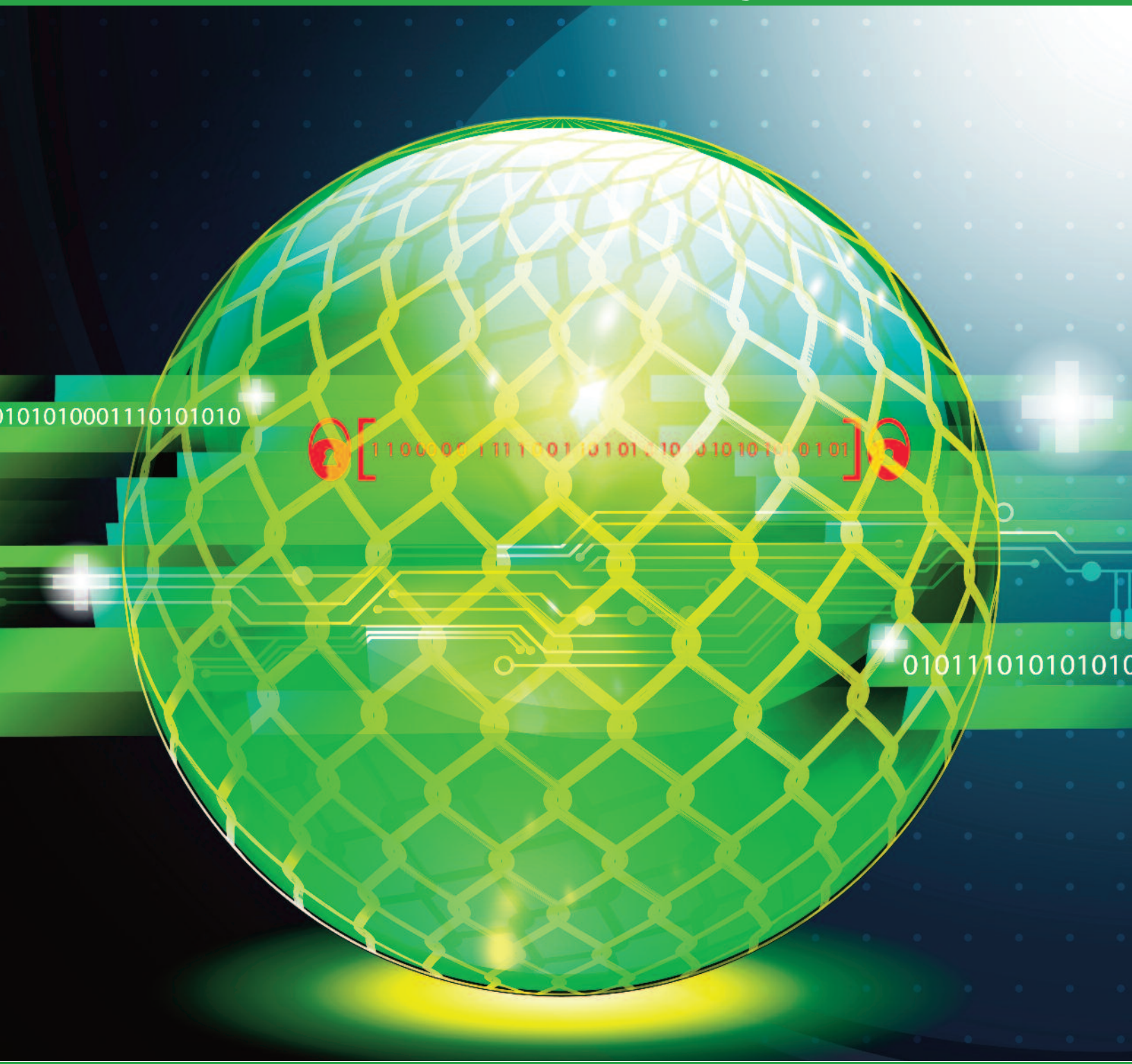
Big Data: A Study for the Equipment Finance Industry



EQUIPMENT LEASING & FINANCE
FOUNDATION
Your Eye on the Future

The Foundation is the only research organization dedicated solely to the equipment finance industry.

The Foundation accomplishes its mission through development of future-focused studies and reports identifying critical issues that could impact the industry.

The Foundation research is independent, predictive and peer-reviewed by industry experts. The Foundation is funded solely through contributions. Contributions to the Foundation are tax deductible.

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Preface

Big Data is making significant inroads in corporate decision-making today, leading to profitable results for many businesses in many industries. As a result of mounting interest in Big Data within the equipment leasing and finance industry, members of the Equipment Leasing & Finance Foundation (the Foundation) believed it would be useful to explore the concept of Big Data and provide an application roadmap that could be used by businesses in the industry. This Study describes how the use of Big Data by equipment leasing and finance firms may result in a more comprehensive understanding of markets, customers, channels, products, regulations, competitors, suppliers and employees.

"Big Data: A Study for the Equipment Finance Industry" is a forward-looking study published by the Foundation, undertaken as part of the Foundation's continuing efforts to bring new and meaningful insights to the equipment leasing and finance industry.

The Foundation engaged *Genpact*, a global leader in business process and technology management services, to conduct research and generate this Study. The Study is based on industry research, Genpact's Big Data Analytics implementation experience, and in-depth interviews conducted with industry experts. Additional anecdotal information stemming from recent news events has been included (under Fair Use provisions of The 1976 Copyright Act) at certain points to provide real-life examples of the use and benefits of Big Data.

The Foundation and Genpact would like to thank those firms that participated in the study. Without their support and the support of the Foundation, this study would not have been possible.

GENPACT
INTELLIGENT ENTERPRISES POWERED BY PROCESS

Executive Summary

"Big Data: A Study for the Equipment Finance Industry" presents the role Big Data plays today, and can play in the future, in equipment leasing and finance companies. The Study examines the current state of understanding and application of Big Data both in the equipment finance industry, as well as in other industries. The study then details the as-yet-untapped potential of Big Data and its many applications for and benefits to the equipment leasing and finance industry.

Specifically, Big Data can enable equipment leasing and finance firms to excel in a variety of ways, including:

- Increase shareholder value
- Increase customer satisfaction
- Evaluate potential new market opportunities
- Develop new products and services
- Stay ahead of competition

Globally, 64% of companies have already invested in some aspect of Big Data or say they plan to invest by June 2015. By region, 38% of U.S. businesses, 27% of businesses in Europe, the Middle East and Africa, and 26% of Asia-Pacific businesses have already invested. In the Asia-Pacific region, 45% of businesses report plans to invest in Big Data over the next two years, lifting adoption rates to the same proportions as in the US.

The harnessing of Big Data is clearly a global trend. It is also a trend expected to benefit exponentially those equipment leasing and finance firms that invest early. An investment means first identifying the corporate goals that could be met by Big Data, then choosing the data sets to be analyzed, the method(s) of analysis to be used, and the construction or alteration of infrastructure necessary to handle the activity. Companies which successfully complete these steps will likely be able to identify easily additional sources of revenue, meet aggressive pricing and sales goals, increase customer satisfaction and generally outperform competitors in their markets.

Successful adoption of Big Data in an equipment leasing and finance firm hinges on driving the initiative through the entire organization by forming Big Data business groups comprised of information technologists, business leaders and data analysts who understand Big Data and are comfortable working with its applications. Perhaps most important, though, are visionary leaders in the C-Suite who can play a critical role encouraging enterprise-wide adoption of Big Data, and then work to drive tangible value across the enterprise.

The Study observes that today's leaders of equipment leasing and finance firms are aware of the Big Data movement and some of its applications, but also notes that a number of firms are still at a nascent stage, working to gauge the relevance of Big Data for their businesses. However, there are many vendors who specialize in developing Big Data programs and integrating them with existing infrastructure to drive new and insightful conclusions to business questions.

A Big Data Story

SAN FRANCISCO BAY, September 26, 2013—In one of the biggest comebacks of yacht-racing history, Oracle Team USA achieved what just one week before had seemed impossible: the imposing, all-black, multi-hulled sailboat raced to its eighth consecutive victory, defeating Emirates Team New Zealand 9-8 to win the 2013 America's Cup, the oldest trophy in international sports and one of the most prestigious yacht-racing titles in the world.

What does this sporting event have to do with Big Data? Plenty. Although both finalist teams raced 72-foot Catamarans equipped with state-of-the-art aerospace technology, Oracle Team USA went a step further. After each race, the team analyzed large amounts of data collected from more than 300 sensors installed on its yacht.

Data was transmitted during each Cup race from the sensors to a server in the Catamaran's hull and then to a computer on the team's chaser boat. The data was subsequently analyzed and used to make modifications, each designed to increase speed, to the Catamaran's body, hydrofoils and wing sail. Team Oracle disclosed its modifications by filing a new measurement certificate for every race.

"We pull[ed] about a gigabyte of raw data per day, as well as about 200 gigabytes of video per day," Oracle Team USA's director of information systems told reporters. Oracle CEO Russell Coutts told *The New York Times* that the biggest changes were made in "the balance of the boat, where the load sharing between the foils is critical." Changes were made, Coutts said, by manipulating wing shapes and flaps. Oracle Team USA's Big Data efforts made all the difference. Even when trailing the New Zealand team 8-1 and within one defeat of losing the Cup, Oracle Team continued to upgrade its boat and against over-whelming odds, went on to win an unprecedented eight straight races to defend the America's Cup trophy.

Big Data, Defined

Gartner, Inc., a leading information technology and research advisory firm, defines Big Data as "high-volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision-making."[1] But what, exactly, does that mean? Webopedia, a free, online dictionary of terms used in computer and Internet technology, provides a more digestible definition. Says Webopedia, "Big Data is a catch-phrase used to describe a massive volume of both structured and unstructured data that is so large, it's difficult to process using traditional database and software techniques."

Yet, "Big Data" can also refer to the technology a company uses to manipulate and store this data. A recent article in *informationWeek* Magazine contained the following observation: "[Big Data is] about building new analytic applications based on new types of data in order to better serve your customers and drive a better competitive advantage." Thus, the term Big Data can be used as both a noun and a verb, referring to colossal amounts of structured and unstructured information, and to technologies used to collect, store and analyze that information.

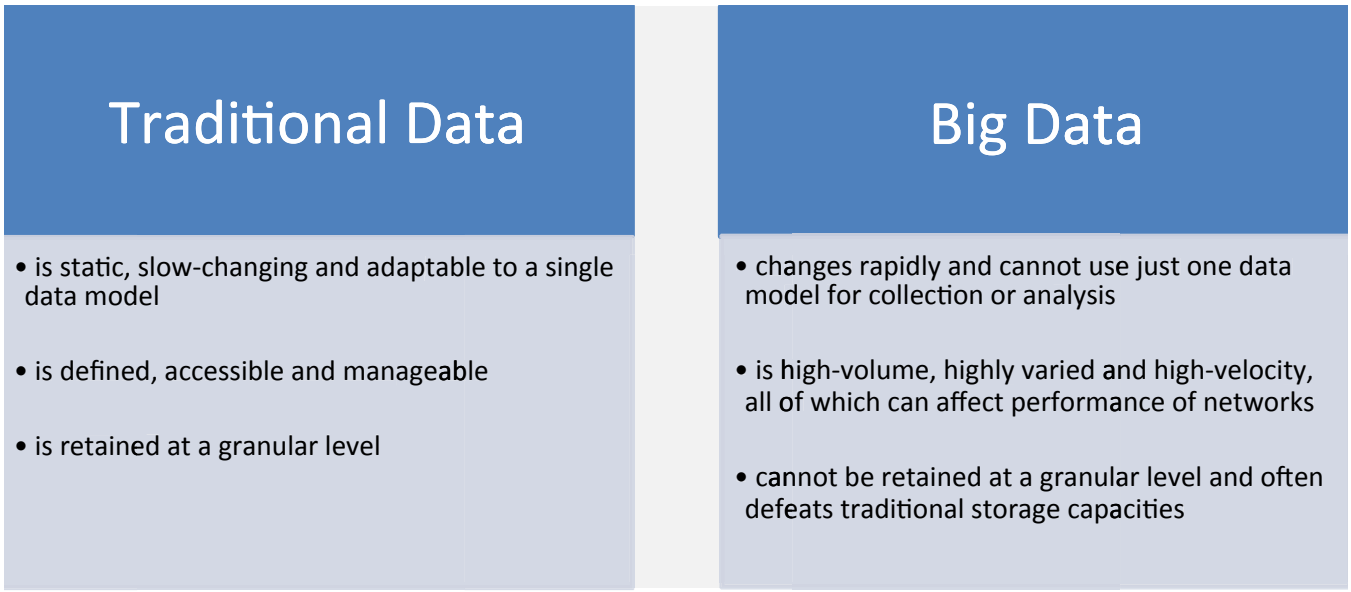
Equipment leasing and finance firms deal with Big Data on a regular basis. Some of the data is structured, or organized into information sets that reside in fixed locations. Structured data includes relational databases, spreadsheets and machine-generated data.

[1]Gartner, Inc., "Best Practices for Data in Financial Services," August 2012

Other data is *unstructured*, or free-form, and does not reside in fixed locations. Examples of unstructured data include videos, e-mail, PDFs, word-processing documents, web sites and blogs. Collection and analysis of Big Data is changing the way companies plan and conduct their business. From understanding customers and markets to mining information about products and operations, firms around the world are examining and analyzing increasing amounts of data to streamline processes, update products, enter new markets and generally make decisions more quickly. Results of using Big Data may not always be as visible or as dramatic as those of Oracle Team USA, but technology experts believe it's just a matter of time until companies employing Big Data strategically pull away from their competition and leave them choking on ocean spray.

Before examining what Big Data can do for equipment leasing and finance firms and how it can do it, let's look more closely at some Big Data and its characteristics. Figure 1 lists important differences between Big Data and Traditional Data, as well as important challenges that Big Data presents.

Figure 1 – Traditional Data versus Big Data



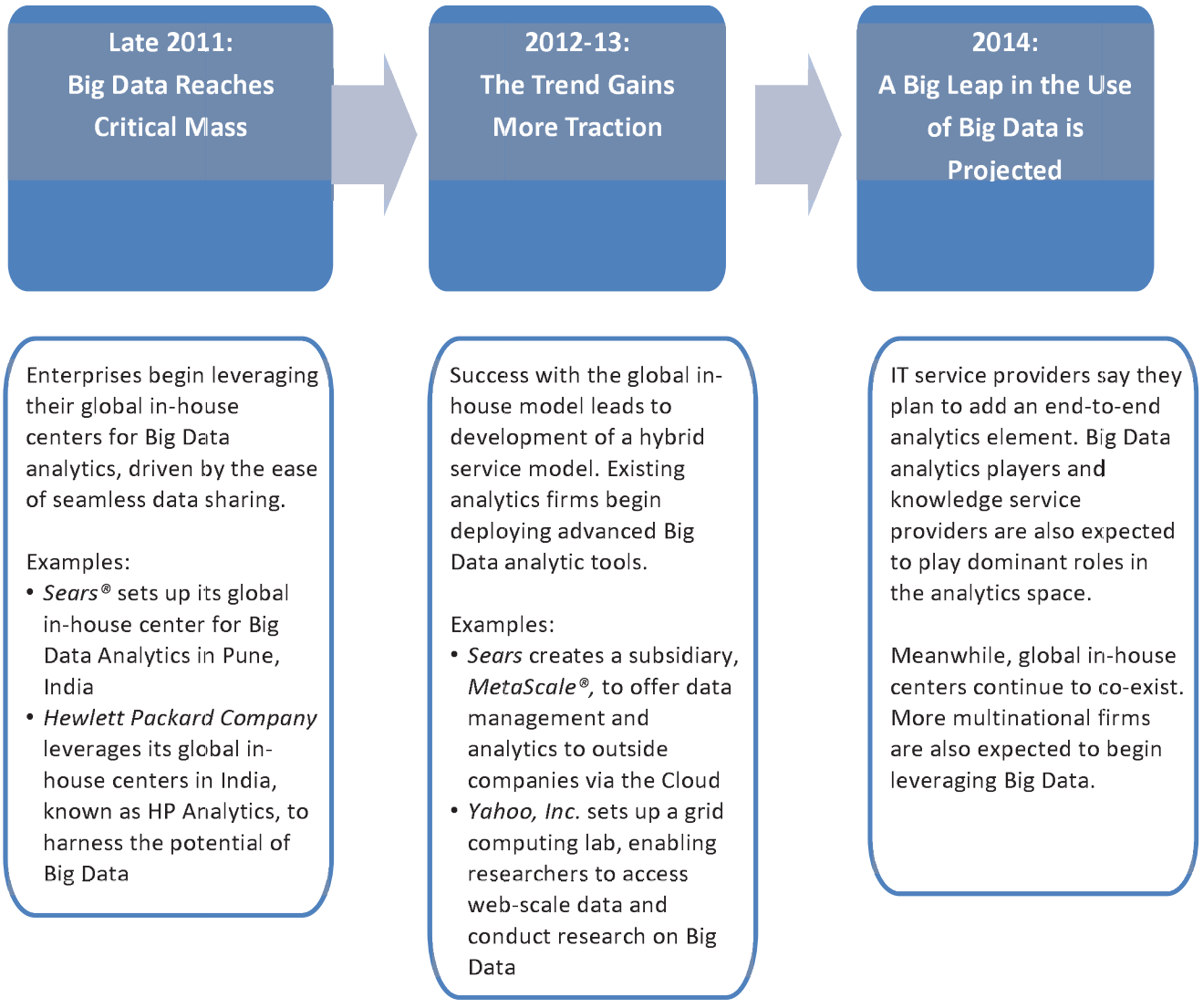
Source: Gartner, Inc., "Best Practices for Big Data Maturity in Financial Service," August 2012

Big Data's Evolution

The term "Big Data" had already become part of the technology lexicon in August, 1999, when researchers writing in Communications of the ACM (Association for Computing Machinery) used the term to describe gigabyte data sets. Just three months later, a panel discussion entitled "Automation or Interaction: What's Best for Big Data?" took place at a conference held by IEEE, which claims to be the world's largest professional association for the advancement of technology. According to Forbes.com, by 2008 Big Data computing had become the topic of books, papers and much discussion. By 2011, conglomerates had begun investing in infrastructure to store, integrate and analyze massive amounts of data. By 2013, segments of retail, banking, manufacturing and insurance had announced strides in their use of Big Data.

Figure 2 details the most recent evolution of Big Data. Ultimately, the number of vendors offering a range of Big Data Analytics solutions is expected to increase.

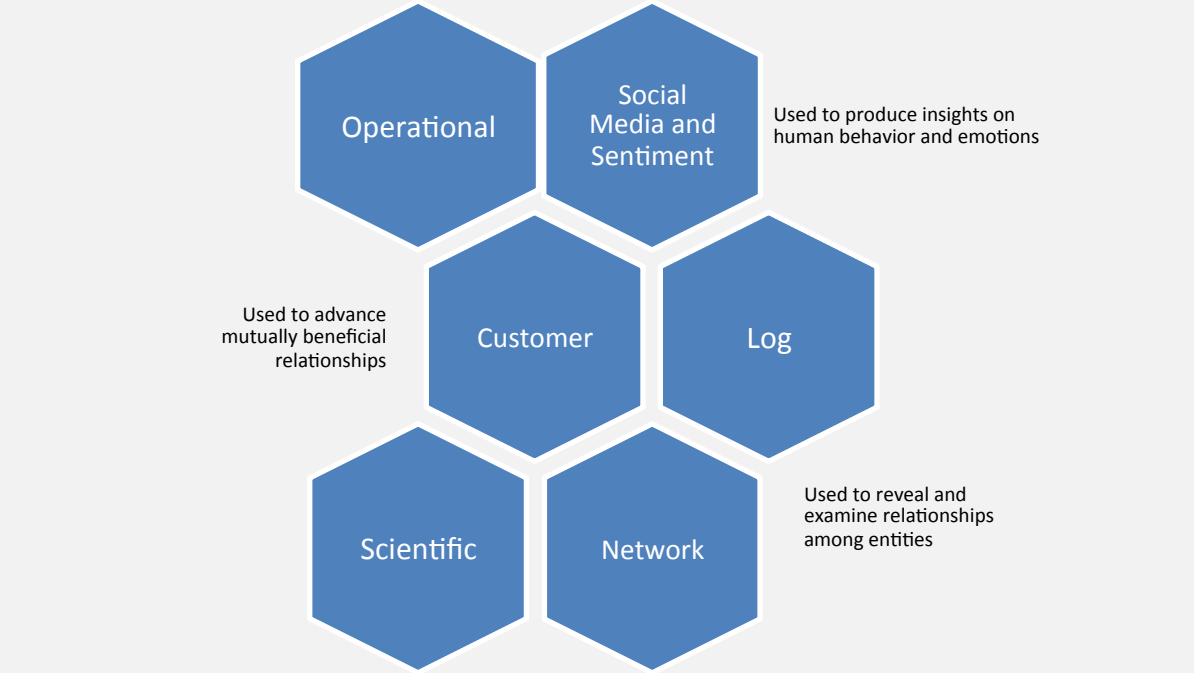
Figure 2 - Evolution of Big Data



Types and Sources of Big Data

Industries use various types of data for Big Data applications, but most of these types can be broadly organized under the categories shown in Figure 3.

Figure 3 – Data Types used for Big Data Application



Operational Data generated by machines and automated processes can be analyzed to help meet Service-Level Agreements (SLAs), uncover hardware issues, and manage data centers or manufacturing facilities.

Social and Media Sentiment Data can be subjected to customer behavioral analysis that extracts patterns and provides insights into customer behaviors. These patterns and insights can help companies provide maximum value for the customer through improved service, new products and services, and development of other opportunities to grow relationships between the firm and its customers, vendors and partners.

Customer Data can be analyzed and used to determine geographic and demographic trends, to narrow or broaden marketing strategies, and to test-market and launch new products. Log Data is often analyzed to understand compliance issues, to troubleshoot machine and process errors, to optimize web sites and to deflect security incidents. Insights can be derived from click-streams, web logs and virtually any data generated by machines or automated processes.

Analysis of *Scientific Data* involves techniques used to investigate phenomena, acquire new knowledge, and correct or integrate previously discovered information. Examples of scientific data analysis include genome sequencing, climate prediction, geological exploration and detection of disease outbreaks. Analysis of *Network Data* can reveal and examine relationships among various entities, such as entities being served by the network.

As a trend, Big Data deployment is still in its infancy. But as industries identify business needs that Big Data can fill to help make better decisions and develop continuing capabilities, companies will likely shift from IT-designed analytics to business-designed analytics. As they do so, prospects for delivering still greater business value to customers and companies alike will increase.

Big Data, Well Deployed

Like many Fortune 500 companies, construction and mining equipment manufacturer Caterpillar Inc., has begun collecting, storing, and analyzing Big Data. Writing in *Fortune* Magazine in its October 28, 2013 issue, Stephanie Mehta reported that the Peoria, Ill.-based firm is "equipping its machinery with sensors, radios, GPS receivers, and software in an effort to develop a global technology platform that will allow equipment owners, dealers, and Caterpillar itself to examine all information emanating from those trucks, earthmovers, and other machines." Caterpillar's progress with Big Data is exemplary for the equipment leasing and finance industry in that, as Mehta said, "A rugged work environment such as a construction site could be as high-tech as a corporate office."

Yet, heavy-equipment makers have been adding gadgets to their gear for years. A CAT® excavator might feature digital systems that aid and monitor grade control, payload, or machine health. GPS and laser technology can allow operators to program their machines to dig at precise depths and slopes. "We have a lot of software engineers that are new in the last 20 years to our business," Caterpillar CEO Douglas Oberhelman said at a 2012 *Fortune* technology conference. "It's a tremendous opportunity to really use technology in something you can see move, and either push dirt or pull a freight train, or sexy stuff like that."

What's new, Mehta reported, is a company-wide push by Caterpillar to have its equipment—and increasingly, non-CAT machinery as well—connect to "an intelligent network that can monitor the gear and provide reports on equipment repairs, operator usage patterns, and other events." Dealers can use the data to watch for upcoming repairs, and stock inventories accordingly. Site managers can monitor fleets to determine if operators are misusing or needlessly idling equipment. For Caterpillar, connected machinery is a new selling opportunity, says Mehta. Along with preloading equipment with its technology, the manufacturer also offers kits that enable older gear (or rivals' machines) to connect to the CAT network. Then there's the potential for recurring revenue from ongoing data-access and software subscriptions. "It's a huge opportunity to upsell," a Caterpillar spokesman said.

Caterpillar can also sort through this data for clues to build better products, predict customer needs, and predict market trends—all of which are the promise of Big Data. "It's the holy grail," an executive at Salesforce.com, which is powering part of Caterpillar's network, told *Fortune*. But as Mehta noted, "For a company that knows a thing or two about excavation, data mining shouldn't be much of a stretch."

Intelligent analysis and application of Big Data *can increase shareholder value, increase customer satisfaction, increase revenue, and increase rates of profit growth.* But to understand how Big Data could achieve these objectives in equipment leasing and finance, it's important to examine the Big Data work being done in other industries.

How Other Industries are Using Big Data

Gartner's 2013 survey shows that banking, media and communications, and service industries are leading this year's investment in Big Data. Insurance carriers and retail firms are also investing heavily. Following is a glimpse at Big Data implementation in banking and insurance, two industries that bear similarities to equipment leasing and finance.

Banking (excluding equipment finance)

Banks typically execute Big Data projects to explore new projects, technologies and data sources, or to run current processes more effectively and focus on enhancements that pay off quickly. Following are examples of Big Data applications effectively implemented by banks.

Risk Management and Fraud Detection

After the financial crisis of 2008-2009, risk profiling and fraud detection became top priorities for banks. Use of alternative channels, such as ATMs and computers, along with increased delivery speed of the data being produced through these channels, provided banks with enhanced views of customer spending behavior and finances. The ability to track consumer behavior beyond bank credit-card accounts (in checking and savings accounts, personal loans, mortgages and so on) also isolated new fraud or risk triggers, allowing banks to develop processes for contacting customers when their spending behaviors deviated from set patterns.

Personalization

Online banking is convenient for both banks and their customers, but what is lost is person-to-person interaction. To compensate for that loss, banks have begun integrating data across multiple channels, including web click-stream data, account profile information and social media activity, to create a 360-degree view of customers that can be used to target product offerings that best suit their financial needs. Some banks are using similar approaches to group customers for risk assessment, cross-selling and up-selling opportunities.

Emotional Connections with Customers

Banks look for emerging Big Data tools to understand hidden consumer sentiments on a real-time basis:

- *Customer Feedback through Sentiment Analysis:* Sentiment analysis tool captures customer feedback through a social media platform. It provides analysis in real time and enables fast decision-making and quick reaction to any negative opinions. Banks can also design loyalty and reward programs and decide on how to best reward customers.

- *Predictive Analytics to Capitalize on Customer Insights:* Customers' transactional needs are becoming even more diverse and unpredictable. Predictive analytics can mine historical data to gauge the likely occurrence of an event. Banks are also generating actionable insights, based on transaction and behavior patterns. These actions are revamping product offerings and service strategies.

At present, most Big Data initiatives in banks are operating outside existing traditional approaches to data governance. The focus is currently on standardization, centralization and retention of data. Due to the differences between Traditional and Big Data characteristics, most banks will need more time to embrace Big Data. Most current initiatives are business-case-directed and have not been formally labeled as Big Data initiatives. These projects typically focus on such specific business benefits as:

- Boosting algorithmic trading through analysis of high-volume and high-velocity market data, coupled with news and blog posts. This capability may not be visible or available to less agile traders.

- Preventing fraudulent ATM and credit-card transactions through analysis of high-volume contextual and transactional data, such as customers' past transactional behavior from multiple sources. "Ethoca," for example, is a secure network for credit-card issuers and merchants that brings together data from merchants and banks to detect payment fraud. Such detection is often not possible using data from only one of these sources.

- Though Big Data initiatives at banks are still evolving, banks and vendors are realizing the importance of being up to speed with measured experimentation on Big Data.

Hybrid Data

Banks have also begun to realize the importance of embracing hybrid approaches that combine data centralization and standardization to enable heterogeneous Big Data environments. As a result, vendors are starting to support such hybrid approaches and include these:

- First Derivatives, a provider of products and consulting services to the capital markets, and VistaOne, a global leading provider of financial data management services and products to the securities industry, have introduced solutions that allow banks to integrate services with in-house-deployed software.

- GoldenSource, a global software company in the Enterprise Data Management industry, has announced plans to incorporate Big Data technologies, as well as software-as-a-service, for customers.

Insurance

The insurance industry may be one of the best examples of Big Data implementation from which equipment leasing and finance firms can learn. Comprehensive implementation is still evolving in insurance, but several carriers have successfully merged Big Data platforms with their existing computing environments by leveraging traditional computing, storage, database and analytics. Using appropriate technologies, these companies have found ways to extract, integrate and analyze a large volume and variety of data in structured and unstructured formats, ranging from call-center notes and voice recordings to web chats and social media. Leading insurers have begun—or say they are planning to begin—exploiting Big Data for numerous uses, such as these:

Fraud Detection

Chief Claims Officers (CCOs) are using a multi-channel approach to fraud detection by assessing structured data in their claims and policy data warehouses, and merging them with textual data in adjustor notes, police reports, and Social Media. Special Investigative Units (SIUs) are keen to identify suspicious claims or ones that have subrogation or litigation potential. Text Analytics and Natural Language Processing (NLP) and Text Analytics are enabling innovative solutions in claims fraud detection, in addition to automated business rules, predictive analytics, social media analytics, and link analysis techniques.

Enhanced Customer Understanding

Combining direct customer connections, such as emails, call-center messages, communications with agents, claims-adjustor reports, faxes and traditional mail with indirect customer connections, such as those in social media, blogs and log files, provides a holistic view of each customer. Such enlarged views create opportunities to respond more personally, enabling marketing departments to enhance relationships with customers, achieve better brand value, and gain competitive advantage.

Leveraged Cross-selling and Up-selling Potential

Marketing departments at insurance carriers are moving away from capital-intensive traditional television and Internet

promotions to introduce new products and services and target customers in specific regions. The carriers are also using social media as a cost-efficient and effective alternative to TV, radio and paid Internet advertising.

Applying Best Practices from Other Industries

Big Data can contribute significantly to achieving key metrics in the Equipment Leasing and Finance Industry such as revenue, cost/margins, cash flow, compliance, and customer satisfaction. This can be done by helping companies serve functional delivery needs, such as cost-efficient and timely processing of customer or transaction data, or through improved decision-making insights leading to new business growth and increased revenue streams.

Big Data holds significant potential to leverage new and existing data types for competitive advantage. Many companies across industries have initiated activities for testing new analytics tools to handle internal and external Big Data, and are looking for business cases. While the technical challenges are a factor in Big Data adoption, perhaps the biggest impediment in an enterprise-wide adoption of Big Data comes in the form of *management of mindsets and the nature of decision making.*

Deployment of Big Data can identify innovative ways of being more effective and efficient. As a bank affiliate said in the 2013 Monitor 100 Report[2], "Focus will be on efficiency, i.e., the winners coming into the next period of economic growth will be those companies [that] have figured out how to sustainably do more with less." Doing more with less could benefit nearly every aspect of equipment leasing and finance, from credit/underwriting to sales to delivery.

Big Data in Equipment Finance: Today

Predictive Analytics in Credit Scoring

Predictive analytics (PA) is the engine in Big Data. This branch of informatics analyzes large amounts of data to help firms better manage risk, improve operations, increase profitability, and make more insightful decisions. A key difference between PA and traditional decision-making is the nature of the information being considered. Financial statement analysis, for example, looks backwards to determine what happened in the past, and often results in decisions being reactive to that past. Predictive analytics helps management look forward and assess how to address future events such as expected customer behavior.

The application of PA in various forms unlocks Big Data. Used to access and combine unstructured and structured data, PA improves predictions and enables the discovery of patterns and trends across multiple types of online sources.

In late 2012, the Equipment Leasing and Finance Foundation undertook a study concerned with applying predictive analytics in three areas of industry functionality: credit scoring, residual management and portfolio management. Application in credit scoring was reported as most developed. Using PA, firms have built credit risk models that use information from each loan application to predict the risk of taking a loss. These models have been refined over time to the point that they now play indispensable roles in credit-decisioning. In fact, today's consumer credit industry could not operate without predictive credit risk models. Credit scoring using predictive analytics has proved so superior to unaided human judgment in both accuracy and efficiency when applied to high-volume lending situations that any company in the credit industry today that does *not* use PA in credit scoring is considered to be at a significant competitive disadvantage.

[2]The Monitor 100 Report, The Monitor, 2013

Processes for managing asset/collateral risk were not well enough aligned in equipment leasing and finance at the time of the Foundation Study to leverage the benefits of predictive analytics. Thus, the study suggested actions firms can take to alleviate the situation. This was appropriate, since surveyed firms indicated that they expected their use of predictive analytics to increase in the coming year, most by leveraging extant capabilities and personnel. Such an approach was expected to help firms realize early on two primary benefits of predictive analytics: increased efficiencies and reduced costs. To learn more about applications and potential benefits of PA in equipment leasing and finance, refer to the Foundation report, "Predictive Analytics: Increasing Profitability, Managing Risk and Enhancing Customer Satisfaction."

Big Data as a Big Picture

To convey how leaders at most firms in equipment leasing and finance currently view the entire concept of Big Data and its potential deployment in the industry, we've included a number of quotations from interviews conducted for this study. We spoke with multiple experts, including CEOs, CIOs, COOs and Group Heads of equipment finance. Below are several key points interviewees shared:[3]

- "Big Data as a concept is actually new. We would be happy to get more awareness on this buzz-word and get insights from other industries on how best this can replicate in our industry."
- "This looks like an emerging concept, and in the long-term future, we may want to figure out how it can be leveraged."
- "Our Company's data needs may not be so intensive to implement Big Data."
- "We may not feel an urgent need to implement Big Data now. Our existing tools could be sufficient to handle the prevalent data."
- "We are trying to understand how this can best create a business impact."
- "We would like to explore more potential opportunities and implementation strategies for Big Data in our Industry."

Clearly, many questions on the overall potential of Big Data and its value in equipment leasing and finance still exist. At the same time, however, a great deal of curiosity and interest are present. Interviewees were asked not only about their levels of awareness of Big Data, but on their future investment plans and understanding of how Big Data could help grow and improve their businesses. Based on responses, Big Data needs were seen to vary across organizations, based on business objectives and the role and business-focus area of the experts interviewed. Nonetheless, significant uncertainty was found to exist regarding how much to invest, what forms of predictive analytics should be applied and to which data, and potential benefits that could result.

Study interviews further revealed that participants varied in their definitions of Big Data. Some saw it as being specific to customer data arising from social media or other unstructured data, while others considered Big Data to be high volumes, velocities and/or varieties of data. Still others thought of Big Data as a specific technology to analyze high-volume data. In reality, Big Data is all of these things.

[3]Six interviews conducted with industry leaders across Banking, Specialty Finance and Captive Finance

Equipment leasing and finance firms will need to agree on a definition to ensure that Big Data consulting and implementation meet the industry's needs.

The pace of business activity and the need to handle multiple sources of structured and unstructured data is increasing daily. To remain competitive and comply with changing regulatory environments across geographies, equipment leasing and finance organizations need access to robust data-driven business insights. Based on discussions with Study interviewees, key business objectives and conditions in equipment leasing and finance that could benefit from implementation of Big Data include the following:

- Rapidly increasing sources of data, such as click streams, mobile applications and social media
- Exponential growth in the speed of data generation and data complexity
- The need to store, analyze and use unstructured data to gain new business insights
- Enhanced prospects for innovation, improved agility and increased profitability
- The need to analyze data in real time to achieve greater competitive advantage.

The Big Data awareness, level of adoption and potential value ascertained by ELFI organizations varies based on the following factors:

- Business objectives – Organizations and their C-suites have varied business needs with prime focus on improving insight based decision making and leading to new growth and revenue streams.
- Data availability – Data type, characteristics in terms of volume, variety and velocity help in determining need for Big Data and its applications.
- Role and business focus areas of decision-markers – Understanding of Big Data needs vary across business functions. There is a business need for IT and business leaders to work together and determine Big Data needs.
- Organization characteristics – Size, revenue, net income, business operating scale in terms of number of offices/geographies, business growth, IT budgets and discretionary spending play a role in determining Big Data investment plans.
- Functional delivery needs, such as cost-efficient and timely processing of customer or transaction data.

Big Data in Equipment Finance: *Tomorrow*

Once an equipment leasing and finance firm achieves clarity on its business objectives, availability of data and existing technology landscape, it can partner with vendors to introduce Big Data elements to the firm's existing technology infrastructure and data warehouses. Big Data can function as an effective platform to create greater transparency, to segment and analyze real-time customer data, to enable experimentation, and develop innovative business models. It can also be applied to introduce new products and services, and ultimately to make more robust and timely business decisions.

Creating Transparency[4]

Equipment leasing and finance firms spend considerable time collecting and analyzing relevant information. The effort and cost of doing so can be considerably reduced when Big Data is harnessed to digitize this information. Digitization not only will ensure that data is available through networks; it will also help deploy search tools for easy access of information.

[4]McKinsey Institute Report on Big Data , "The next frontier for innovation, competition, and productivity"

Segmenting and Analyzing Real-Time Customer Data

Through technological improvements, firms can segment and analyze real-time customer data. Combinations of attributes, such as demographics, customer purchase metrics and shopping attitudes and behavior, can be examined for patterns and used to add value to company products and services.

Supporting Human Decision-Making with Automated Algorithms

Generally, Big Data-based Analytics examines vast amounts of data to find trends and answer questions. These analytics include rule-based systems, statistical analyses, and machine-learning techniques, all highly mathematical tools that are required to deal with such large amounts of data. New forms of data-based analytics are also being developed and will be used to enhance decision-making.

Enabling Experimentation

Firms can digitize and store granular data on transactions. They can also use a scientific process of controlled experimentation that includes formulation of specific hypotheses, designing and conducting experiments to test these hypotheses, and rigorously analyzing the results before making a decision. Across organizations and industries, leaders have begun using this type of controlled experimentation to make better decisions.

Innovating Business Models, Products and Services

Big Data can help companies create new products and services, enhance existing ones, and invent new and effective business models by using the following tactics:

- Analyzing consumer behavior data and developing business models to target the most desirable consumer segments
- Making real-time price comparisons that provide consumers with a high degree of price transparency
- Creating innovative, after-sales service offerings that form the basis of next-generation products
- Creating products and services based on customer locations.

The role of Big Data and its potential to impact business has yet to be realized by the vast majority of equipment leasing and finance firms. But this will change in the next five to 10 years as progressive firms form realistic implementation plans to make Big Data a successful reality. The timeframe for realizing benefits will vary, based on company business goals and challenges, plans for short-term and long-term business growth, data management and integration challenges, and related Big Data projects specific to the type of business and scale of operations. Even so, specific elements are required for inclusion in any Big Data implementation plan that is successful.

Components and Strategies for Successful Adoption

The following three components are essential for the successful long-term adoption of any Big Data implementation plan:

1. Identifying and Business Models, Products and Services

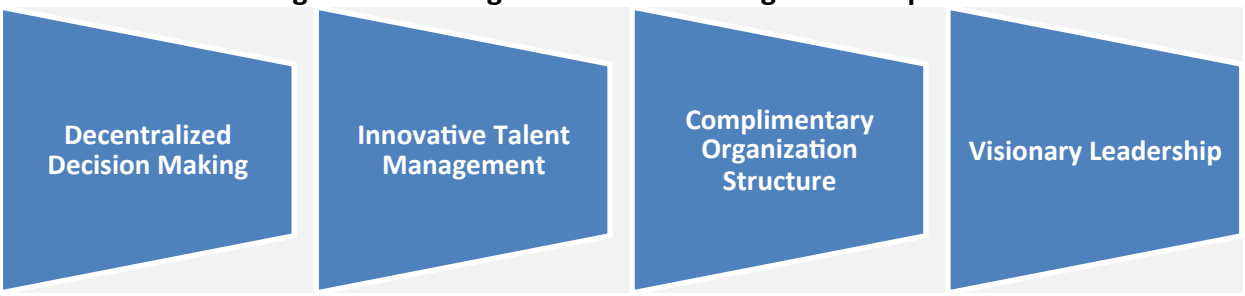
Equipment leasing and finance firms should assess potential scenarios for Big Data applicability on an end-to-end basis business-wide with a view on key objectives. Stakeholders for these objectives (which may include expanded customer service, new product offerings and increased revenues) may be organized into brand teams who want to understand customers better. Firms should also look to identify key Big Data characteristics of business problem(s) that cut across functions and silos, such as data access, processing requirements, forms of predictive analytics and reporting.

2. **Knowing and Managing Data Sources**
   Companies should also identify key data sources, data types, cross linkages and existing or potential data aggregation strategies. This research should then be followed by data classification based on key attributes, such as update frequency and storage requirements.

3. **Planning Infrastructure Investments**
   Equipment leasing and finance firms should also identify one or more suitable deployment model(s) for Big Data infrastructure. This model should be based on requirements such as security, frequency of and type of usage, application scale, and storage requirements. Firms should also identify recurring ad-hoc computational needs of applications that handle concurrent user activity. In particular, firms should determine whether their business requirements can be met with a so-called off-the-shelf Big Data platform, or if a customized Big Data implementation that runs on a commodity cluster is required.

   For any successful adoption, the initiative must be driven across all business functions and IT, and have the support of all company business leaders. Figure 4 shows areas of focus that are required to adopt Big Data successfully.

Figure 4 – Strategies for Successful Big Data Adoption



Decentralized Decision-Making

When data is scarce or expensive to obtain, it makes sense to rely on the knowledge of a small set of well-placed people. This knowledge usually comes from observing and internalizing patterns and relationships culled from years of experience. The traditional top-down management decision-making is a direct outcome of living in such a data-scarce environment. Big Data promises to change all this. By ushering in an age of data abundance, it seeks to democratize decision-making from an "intuition-driven" exercise to one that is largely "data-driven" and decentralized. Executives interested in leading a Big Data transition should get into the habit of asking "What does the data say, what is the source, and what analysis is appropriate?" when faced with an important business decision.

Innovative Talent Management

As data becomes cheaper and easier to obtain, the role of data scientists and other skilled professionals who can handle large amounts of information becomes crucial. Unlike the classical statistician, the data scientist is equipped with Big Data skills rarely taught in traditional schools. A true data scientist is an amalgam of solution leader and technology expert, one who can support and guide business leaders into reformulating their business challenges into computational problems that Big Data can help solve.

People with such skills are hard to find and even harder to retain. Attracting such talent to an organization requires

an understanding of the value system possessed by this new breed of scientists. While money is an important part of the package that may be offered, what is usually more important to a data scientist is the excitement the job profile brings. Data scientists are not consultants; they don't sit on the fence and offer advice. Instead they want to be in the thick of things, harnessing and structuring large masses of data, understanding implications of statistical and architectural design choices in real-time, and interpreting analysis results from a business perspective. While equipment leasing and finance firms should leverage external help in creating Big Data practices, they should also look to develop internal expertise in areas that will help leadership drive home the benefits of investing in Big Data Analytics and enable leveraging third-party vendors to drive targeted solutions toward immediate and long-term benefits.

Complementary Organization Structure

Too often, companies delegate the task of handling Big Data to their IT departments, which in turn purchase an expensive Big Data solution in response. The end result is often sub-optimal, since the onus of generating insights usually lies with the business and sales teams, and not with the IT department. A much better approach is to consider pairing business leaders with people who understand and are comfortable working with data. Combining these complementary skills can help guide teams to decisions that exploit the data opportunity in service of the business's progress.

Visionary Leadership

While Big Data brings the power of data-driven insights to an organization, it does not erase the need for human vision. The hallmarks of a leader include the ability to spot big opportunities, to set clear goals for him/herself and team, to define success factors, articulate a clear company vision, visualize novel yet compelling market offerings, and ask bold questions about the future of the company. All of these skills are essential to encouraging enterprise-wide adoption of Big Data and driving tangible value across the enterprise. Ultimately, it is company leadership and its ability to embrace Big Data that will determine the success or failure of a Big Data adoption program.

Implementation

A Big Data Analytics adoption program is an iterative process. All iterations have to address a specific business need. The process is slowly transformed into a comprehensive platform that caters to the analytics needs of the entire organization.

The iterative approach to solution implementation is strongly recommended for any Big Data adoption program due to following reasons:

- Big Data programs usually begin with a clean-slate approach, in which the outcome is unknown and difficult to define.
- The selection of an analytics model and accompanying tools and techniques is based on certain assumptions made by examining identified data elements. Once implemented, the outcome of result interpretation may shed new light on these assumptions and require corrective action.
- The need to analyze and integrate newer data elements and data sources will change over time, according to the strategic direction of the business. Having an iterative approach allows for this seamless integration.

Prevalent Techniques and Technologies

As in the case of technology platforms, companies would need to first centralize a new technology and the skills to master it. Big Data skills—particularly data-driven analytics abilities—are in acute shortage today. Over time, however, as new technologies enable easier learning and usage, many IT professionals are expected to shift into Big Data functionality.

Hadoop

With more organizations recognizing values and advantages associated with Big Data, adoption of Hadoop software is growing. Hadoop is a generic processing framework developed to execute queries and other batch-read operations against massive datasets that can be tens or hundreds of terabytes and even petabytes in size (see Appendix I).

When complex capabilities are required, commercial databases such as Oracle or IBM may not entirely replace Hadoop, but coexist with it.

Hadoop, accompanied with tools from service providers such as Oracle or IBM, can provide a complete package with powerful performance optimization, sophisticated analytic functions, ease of use and rich declarative features that allow complex analysis to be done by non-programmers. These capabilities include enterprise class features for security, auditing, maximum availability, and disaster recovery.

While Hadoop does play a significant role, there are some assumptions associated with Big Data and Hadoop that present significant risks for enterprises. Given the investments it would require to implement a Big Data Analytics project and the strategic impacts the company intends to reap, it is important that enterprises understand these risks.

- Hadoop does not qualify as a database since it does not perform updates or any transactional processing.
- Hadoop also does not support such basic functions as indexing or a SQL interface, although there are additional open-source projects underway to add these capabilities.

NoSQL

These platforms are designed to execute very large volumes of simple updates and reads against a single, very large dataset. They are designed to handle the processing volume needed to support millions and potentially even hundreds of millions of online users. The datasets involved, although typically not as large as those Hadoop targets, may reach tens or hundreds of terabytes in size or larger.

Many NoSQL databases are currently being developed. Prominent ones include Apache Cassandra, MongoDB, Voldemort, Apache HBase, SimpleDB, and BigTable. Most of these technologies are in the early development stages, and most early adopters employ programming staffs that participate in this development.

The use of NoSQL platforms can support or enable the following:

- *Decentralized Decision-making:* Executives interested in leading a Big Data transition ask the following questions when faced with an important business decision:
  - What does the data say?
  - What is the source of this data?
  - What types of analysis are appropriate?

- *Innovative Talent Management:* Using this strategy, skilled professionals such as data scientists work as both solution leaders and technology experts, walking executives and managers through the reformulation of business challenges into computational problems that Big Data can solve.

- *Complementary Organization Structure:* Under this strategy, Big Data teams are formed that include IT specialists, business executives, statisticians and analysts who understand and are comfortable working with data. These teams

decide what questions to ask and determine how to obtain the answers. Then they analyze the results and decide how answers will be applied.

- *Visionary Leadership:* Company leaders should encourage enterprise-wide adoption of Big Data and drive tangible value across the enterprise.

Selecting a Big Data Vendor

The type of Big Data Analytics project implemented could be an end-to-end process or, more simply, an application for a specific business need. In either case, the most important factors for choosing a Big Data Analytics platform are cost, functionality, ease of use, and flexible customization.

Organizations want to approach vendors who not only sell tools or application suites, but who also take ownership of the technical implementation and provide advisory services.

Criteria for Selecting a Big Data Vendor

When selecting a Big Data vendor, equipment leasing and finance firms should consider the following criteria:

- Current offering: The solution's architecture, data-handling capabilities, discovery and modeling tools, algorithms, model deployment options, life-cycle tools, integration, extensibility and support for standards.
- Strategy: Core evaluation criteria include licensing and pricing, the quality of dedicated resources, R&D spending, the ability to execute the strategy specified, and the proposed solution road map.
- Market presence: This includes the vendor's global presence, national presence, installed customer base, and partnerships with other relevant software vendors (Software-as-a-Service (SaaS)/cloud/hosting providers, and professional services firms).

Companies may also wish to look for vendors who could act as enabling partners playing an important role not only in the creation of a Big Data platform, but in migration to the environment.

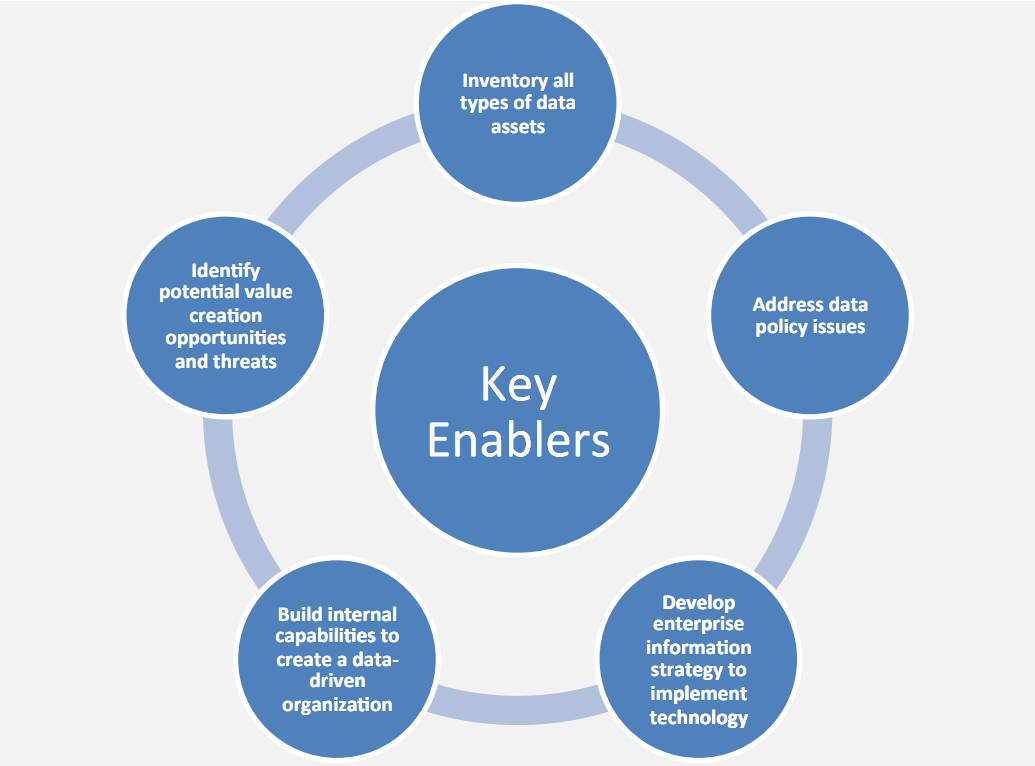
Ensuring Effective, Results-Oriented Implementation

Data is mainly available in three forms: *proprietary, public* and *purchased*. A firm wishing to implement a Big Data project would first need to understand the types of data assets it has or can access. The company must then assess its inventory of proprietary data and systematically catalog other needed data that is available from public and/or paid sources.

Next, data-sharing from third-party resources will likely need to be accelerated. In some cases, the equipment leasing and finance firm may need to create and present a strong value proposition to convince certain third parties to share or sell their data. Technological challenges, such as standardizing data and implementing data feeds, may also need to be addressed to ensure consistent, reliable, and timely access to external data. Access to third-party data and integration of this information with proprietary data is essential for successful deployment of Big Data.

An organization would also need to create a process for identifying and prioritizing Big Data opportunities. Business leaders who can kick-start processes in their respective zones of responsibility should be identified and tasked with this work. To validate opportunities, companies may adopt a process of purposeful experimentation. This can be the most reliable path toward fully leveraging Big Data.

Figure 5 – Preliminary elements for effective implementation



It is worthwhile to note that identifying opportunities and potential sources of valuable data (see previous section), especially external sources of data, can often be an iterative, rather than sequential process.

Building Internal Capabilities

Companies with best practices in Big Data have built talent pools in a core group of deep analytical talent. Given the potential competition for this talent, however, these organizations have had to recruit aggressively. This is often done by sourcing talent from other nations or procuring certain analytical services from vendors. Despite such sourcing strategies, there is still a shortage of Data Scientists, whose capabilities are the most crucial for effective implementation of Big Data Analytics.

Developing Enterprise Information Strategy

Companies need to consider data models and architectures in a holistic manner. An effective enterprise data strategy includes the following:

- Interoperable data models
- Transactional data architecture
- Integration architecture
- Analytical architecture
- Security and compliance, and
- Frontline services.

Many organizations also require additional investment in IT hardware, software, and services that can capture, store, organize, and analyze large datasets. The level of investment varies, depending on the current state of the firm's IT capability and maturity. IT leaders must work with company business leaders to develop business cases for new investments. They must then prioritize spending for those investments.

Addressing Data Policy Issues

Organizations handle sensitive data; thus privacy and security issues are paramount. Firms need data policies that comply with privacy laws and other government regulation. They may also need to consider legal agreements and trust expectations to be established with stakeholders. Once these agreements and policies are established, they must be communicated clearly to stakeholders and to customers.

High data volume, coupled with diversity of format designs, can make for a complex array of problems with data collection, storage, search, analysis, security and use. Exponential growth of data also usually exceeds the capabilities of traditional IT infrastructures, leading to serious data-management problems. Adequate storage is an essential infrastructure component of Big Data, which has been projected to increase—as a whole—at a compounded annual rate of 53% between 2011 and 2016.

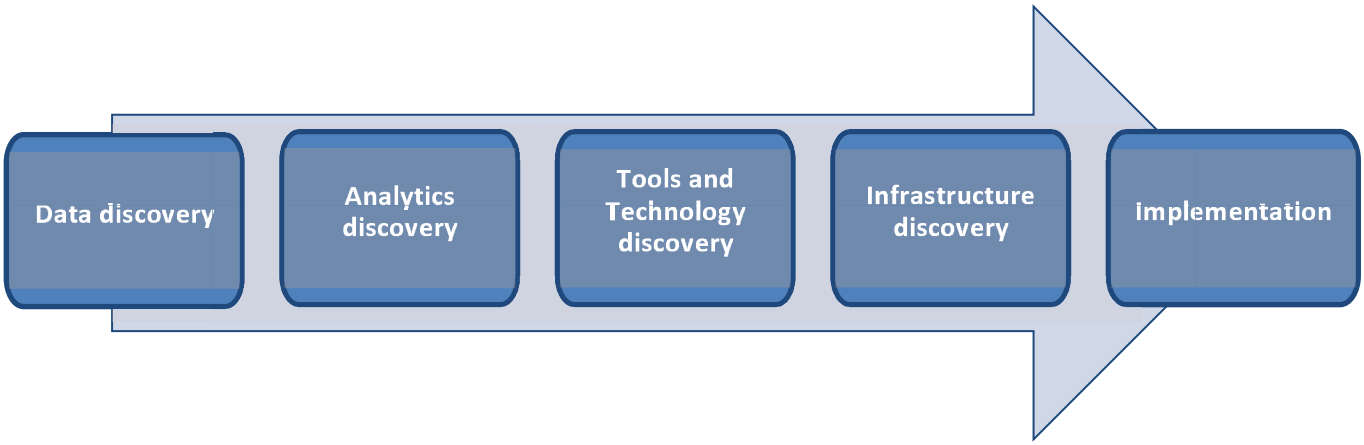
As data volume continues to increase, storage could become a major infrastructure cost for Big Data and Analytics environments unless alternative methods of data collection are used.

Storage is already a critical subsystem for the success of a Big Data implementation. Key challenges faced by companies of all sizes relate to capacity growth and application performance, just as they relate to the ways in which storage can be attached to Big Data Analytics environments. Clearly, performance and cost are two essential considerations when selecting storage architecture. But due to the growing success of Big Data technology, many firms are planning to deploy enterprise-wide storage systems for data analytics infrastructure.

The Five-Stage Framework

Equipment leasing and finance firms must have an appropriate framework to enable successful adoption of Big Data Analytics. Critical components of this framework, and the sequence in which they should be conducted, are illustrated in Figure 6.

Figure 6 – The Five-Stage Framework



The first and most important step is to "discover" and define visible data sources. Data discovery is crucial for defining subsequent solution design and development. Yet, creating a Big Data environment is an evolving process that from time to time involves addition and integration of new data sources that further strengthen the existing analytics operations and bring to light new problem areas to be researched.

Types of Digital Data

- *Structured* – Data that is numerical and resides in fixed fields. For example, words and data in relational databases or in spreadsheets.
- *Unstructured* – Data that does not reside in fixed fields and can't be easily compiled into older database formats. For example, free-form text from articles, email messages, untagged audio and video data, etc. Such data requires technology to process the data in order to analyze it. For example, sentiment analysis by using social media data.
- *Semi-structured* – Data that does not reside in fixed fields but uses tags or other markers to capture elements of the data. For example, XML, HTML-tagged text.

Sources of Digital Data

- *Internal* – Data generated by the company, such as sales figures, customer service information, manufacturing capacity, employee records and visits to the company's website.
- *External* – Data from sources outside the company, such as third-party data and public social media sites, such as LinkedIn, Facebook, Twitter and Google+.

Companies need efficient ways to aggregate data across data warehouses and other data stores to discover new patterns in Big Data. But since most of the data in these stores is structured, it is reasonably easy for analysts to explore it.

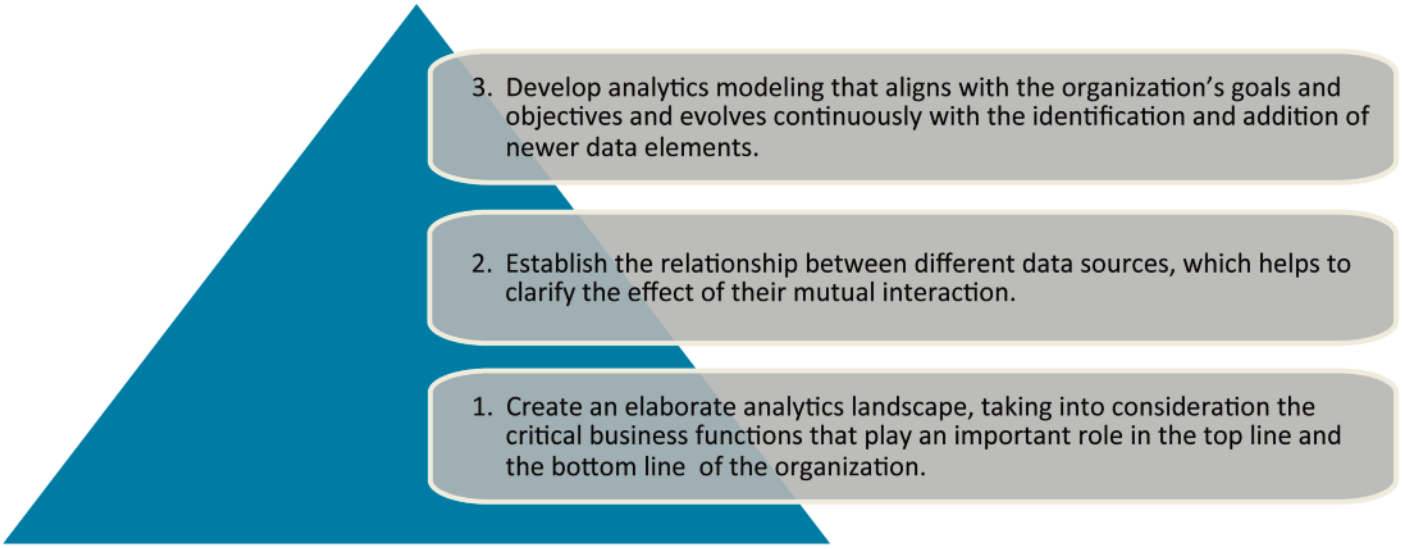
Creating structured data out of semi-structured data, such as web activity, is also relatively easy. However, it is more difficult to analyze unstructured data and to derive a context from it. Unstructured data requires Natural Language Processing (NLP) software to extract usable information.

Companies are increasingly focusing on obtaining external data, particularly data related to customer behavior, to get a complete picture of customer activities that could affect companies. Interestingly, the ever-increasing use of mobile technology provides a tremendous amount of data that tracks customer movements.

Analytics Discovery

Analytics discovery is the term used for identifying data sets and combining them as part of a Big Data adoption roadmap. *The challenge is to mine relevant data for its importance to the company.* The process begins by identifying the necessary data for the vital business-intelligence dashboards. The dashboards are then designed and the Big Data repository is scrutinized to obtain insights. Figure 7 illustrates the process in more detail.

Figure 7 – Analytics Discovery



After identifying vital data sets and defining analytics requirements, the next step is to choose an appropriate mix of technology and tools. This step is crucial for the success of any Big Data program due to the following reasons:

- Each business problem differs from others and therefore requires its own approach. For example, the analysis of structured data would be more efficient and less complex in a fine-tuned Relational Database Management System (RDBMS)-driven setup than it would be in a setup driven by NoSQL.
- Each identified dataset must be handled differently, especially during the initial stages. The core technologies driving Big Data Analytics, such as Apache, Hadoop and other analytic ecosystem tools, are still evolving.
- This is one of the most important phases in any Big Data adoption program due to its direct impact on the program budget. This is also a complex phase because the technologies and solutions are still evolving and are far from mature.

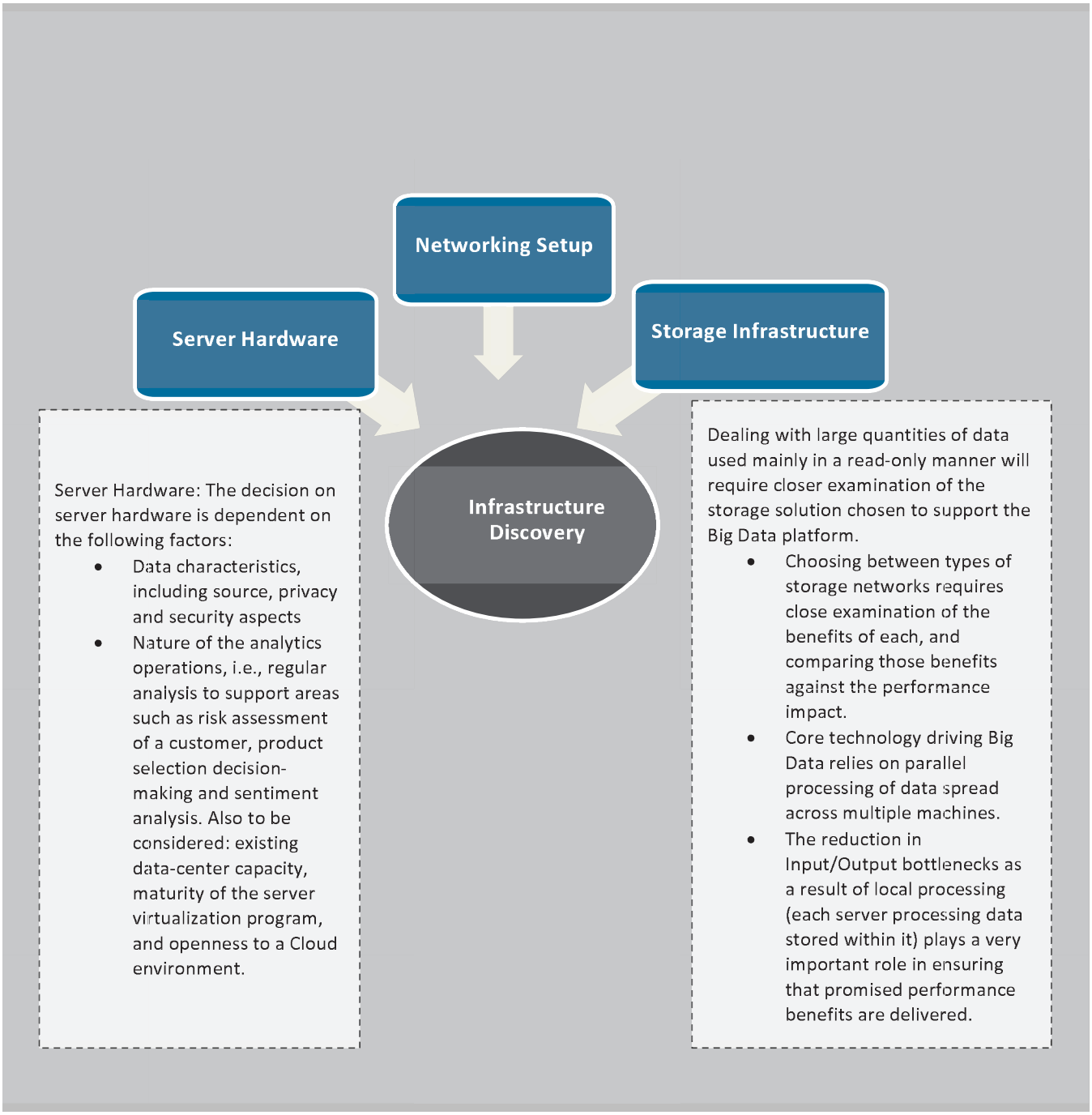
Thus, the ideal approah is to take small steps with a technology component and validate its business value.

Since a single technology solution may not cater to all analytics requirements, investing upfront in one technology or tool may not be conducive to develop a robust Big Data Analytics platform. This is why a focused and detailed evaluation of tools and technologies is required.

Infrastructure Discovery

A Big Data Analytics environment will involve analytics computation on large quantities of data, spread across multiple systems and accessed in a random manner. Decisions to have a separate network for the Big Data environment, rather than leveraging the existing enterprise-wide network, should be weighed against the business risk associated with enterprise application performance degradation, due to the extensive use of network bandwidth by Big Data analytics operations.

Figure 8 – Elements of Infrastructure Discovery



Three primary types of companies exist in equipment leasing and finance: *Banks, Captives* and *Independents*. Each company type experiences different trends in growth and market share. Big Data can provide the required information for these firms to study the competitive landscape and understand their markets. In the increasingly complex regulatory environment, ensuring compliance is a daunting task. Establishing internal rating systems and staying current with portfolio reviews, loss forecasting and capital reserving are problems that banks and bank-owned equipment leasing and finance firms address on a daily basis. These challenges require them to better understand borrowers, manufacturers, equipment dealers, the nature of financing requirements, and associated risks and market conditions. In an effort to identify possible areas of Big Data application for equipment leasing and finance firms generally, Figure 9 shows linkages between desired business outcomes and associated performance drivers.

Figure 9 – Linkage between Business Outcomes and Performance Drivers

Business Objectives / Performance Drivers	Revenue Growth	Profitability	Risk Management	Customer Experience
Customer Acquisition Strategy	Y	Y		
Market Conditions (Economic/Geographic/Industry)	Y	Y	Y	
Credit Decision OR Underwriting (Quality of risk assessment & time-to-market)	Y		Y	Y
Deal Structuring (Pricing, repayment schedule, tenure, collateral, covenants)		Y	Y	Y
Operational Efficiency (Minimize Cost & mitigate operational risk)		Y	Y	Y
Collateral Management (Collateral Valuation, residual value estimates, asset repossession & re-marketing)	Y	Y	Y	
Vendor Dealer Relationships	Y			Y

"Y" represents a direct linkage between performance drivers and business objectives

Using Big Data, equipment leasing and finance firms can derive insights related to performance drivers that would have a bearing on ultimate business objectives. A discussion about how Big Data can affect firms' performance drivers to meet business objectives follows.

Enhancing Revenue Growth

Big Data Analytics can enable organizations to identify efficiently and effectively additional sources of revenue, meet their aggressive pricing/sales goals, and outperform competitors in their respective markets. Companies just beginning to explore pricing excellence can apply the power of data science and segmentation to their transaction data. Big Data can also help explore pricing power as a way to uncover untapped revenue and profit opportunities within their existing customer bases.

For example, equipment finance firms specializing in agricultural equipment could merge farm-level data (gathered through equipment leased to the customer) with public data. This could yield powerful analytics in market segmentation and enhance the firm's ability to position the right equipment for each market segment.

As technology matures and becomes increasingly more customized, data gathered from equipment installed at client sites and data feeds on equipment usage trends could be used to help identify remarketing opportunities.

Profitability

Attractive yields with low delinquencies and low write-offs have led to an increasing interest in equipment financing among banks and other financial institutions. Commercial and industrial assets are performing better today than many other asset classes. As a result, there are opportunities to apply Big Data Analytics to influence profitability drivers. Improved deal structuring is one such driver. There is enormous amount of data around deal structuring (in deal documentation and various lending systems, especially for general equipment finance firms). Documents are a form of unstructured data, which, when combined with historical delinquency/late payment and customer behavior/segmentation data, can generate insights on the nature of terms that should be set for different sets of customers.

Similarly for varied equipment types, combining the deal terms/pricing information with the equipment usage data (geological/climate conditions in which the equipment is being deployed, etc.) could generate insights into the projected life and value of the asset. This could further improve future deal pricing, terms and deal profitability.

Risk Management

Equipment leasing and finance firms must contend with heightened regulatory environments and a variety of market uncertainties. Making effective use of Big Data, firms can pinpoint and mitigate potential exposure to risk and loss.

They can, for example, reduce risk by applying analytics against a variety of data sets. Underwriters know an applicant's credit score alone may not be sufficient to determine the risk of default.[5] To that end, companies can use analytics against macroeconomic, product, and borrowers' demographic data to forecast more accurately the potential for default before issuing loans.

[5]Deloitte Analytics Institute, "Analytics in banking - Taking a fresh look at your challenges," 2011

Firms could also use Big Data to generate early warning signals on customers' challenges in meeting their scheduled payments. Gaining insights from Big Data generated on receivables through the collection and cash application systems of end customers, firms could also identify accounts with a high potential for default. This information can then be used to enable timely actions to mitigate the risks.

While the cash flow of a borrower should be the first line of defense, the collateral is always the contingency plan for lenders. As noted in a recent equipment leasing and finance publication, *"The more is the awareness about the foundations of deals and the collateral that back loans, the better is the risk mitigation."*[6] There is significant data that funders can utilize by adapting their portfolio monitoring systems to meet the unique requirement of each collateral type for accurate valuation and improved monitoring of collateral character.

In commercial-jet finance, for example, tracking aircraft usage and business-owner activities could help assess risk to the asset and/or the repayment ability of the borrower. Resources generate data on every flight taken by registered aircrafts, and this data could feed into firms' collateral monitoring systems, ensuring that terms of use are not breached (geography, hours of usage, etc.). Such monitoring can also protect the value of the collateral. If usage of the aircraft is declining, for example, this could indicate non-renewal at the end of term.

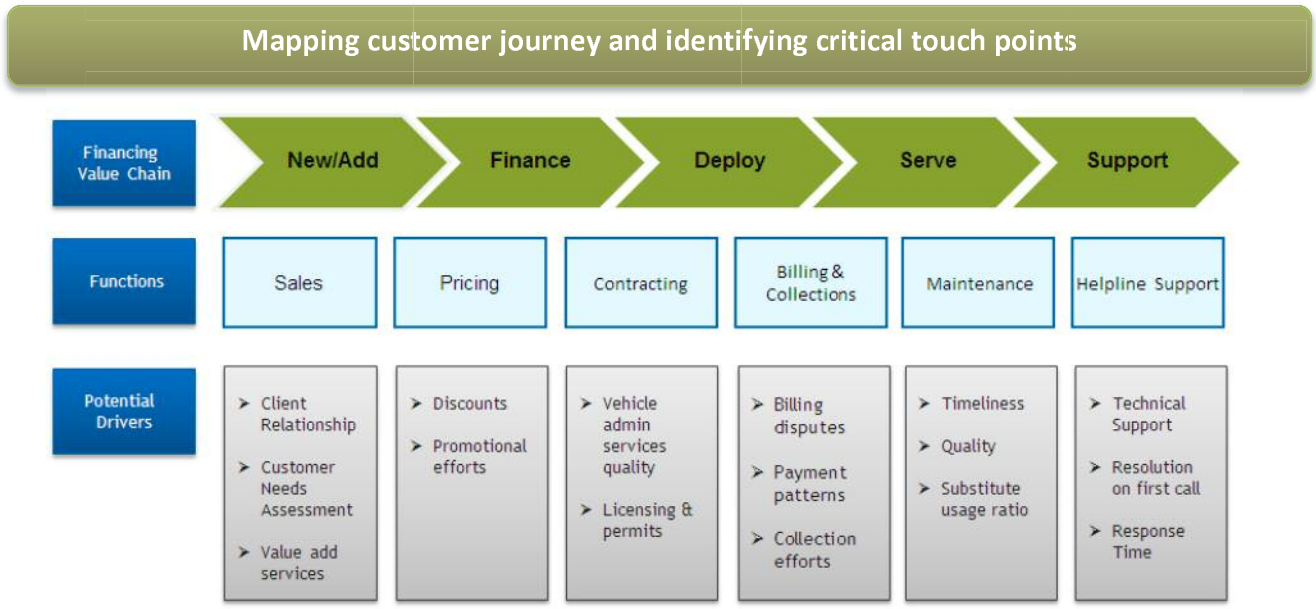
Additionally, title and lien risks could be assessed proactively by enhancing the asset monitoring process, using data or information available from industry and government organizations, such as Uniform Commercial Code (UCC) data and Federal Aviation Administration (FAA) data.

Enhancing Customer Experience

Enhancing customer experience across the value chain at all possible touch points is a key driver to improve customer loyalty. Loyalty has a definitive impact on top lines and profitability through lease renewals, repeat businesses, minimized churns, advocacy, and ease of repossession. Figure 10 maps the industry value chain along with various business functions and potential drivers to include customer experience across various touch points during the deal process. Each of the touch points can provide details on customer experience and satisfaction, which can be further linked with transaction and enterprise data to determine profitability and business growth vis-à-vis customer satisfaction.

[6]ABF Journal, "Managing Big Data-Key to true collateral value & risk control," July, 2013

Figure 10 – Big Data for Customer Experience Management



A Case in Point: Investing Across Geographies

Large corporations across industries are investing in Big Data to leverage more successful business outcomes and drive business growth. Gartner's 2013 survey[7] of 720 respondents reveals that 64% of businesses have already invested in Big Data or plan to invest by June 2015, an increase of 6 percent-points over the 2012 survey.

Globally, media and communications and banking industry are at the forefront of the Big Data investment. Roughly 38% of U.S. businesses have already invested in Big Data, while roughly 27% of businesses have invested in Europe. The Middle East and Africa and Asia-Pacific nations have invested at a rate of approximately 26%, while about 18% of Latin America businesses have invested.

Asian businesses are ambitious in their plans to invest in Big Data, with another 45% saying they plan to invest in the next two years. If this occurs, the rate of Big Data adoption in Asia-Pacific nations will reach roughly the same proportions as the adoption rate in the U.S.

[7]Gartner, Inc., "Survey of 720 Gartner Research Circle Members," June, 2013

GE's Billion-Dollar Bet on Big Data

In an article published in *Bloomberg BusinessWeek*, "GE's Billion-Dollar Bet on Big Data," General Electric was reported to be investing $1 billion in a facility in San Ramon, California, that will be staffed with as many as 400 people. Bill Ruh, the man running the venture, was lured away from Cisco Systems in 2011.

In the the article, Ruh says he wants to marry Big Data with some of GE's biggest businesses. He sees an opportunity to help airlines that buy GE jet engines monitor their performance and anticipate maintenance needs, reducing costly flight cancellations.

The technology could also help companies that lease commercial vehicles from GE Capital to optimize delivery routes and provide early warning that a truck may need a trip to the repair shop. "If I can begin to see that something is starting to deteriorate and get out there and fix it before it breaks, that's a foundational change," Ruh says. "In the end, what everybody wants is predictability."

When it comes to Big Data, GE is playing catch-up to IBM. The world's biggest computer-services company is working with energy companies to extend the lives of oil and gas fields by improving oil recovery through analytics. IBM also is working with Vestas Wind Systems to find better locations for wind farms. Newer entrants are jumping in as well. Splunk (SPLK), a San Francisco-based startup that just went public, says its customer rolls exceeded 3,700 as of the end of January.

GE is counting on its expertise making industrial equipment—from gas-fired electrical turbines to locomotives—to give it an advantage over rivals focused on exclusively providing data solutions, says Ruh. "If you don't have deep expertise in how energy is distributed or generated, if you don't understand how a power plant runs, you're not really going to be able to build an analytical model and do much with it," he says. "We have deep insight into several very specific areas. And that's where we're staying focused."

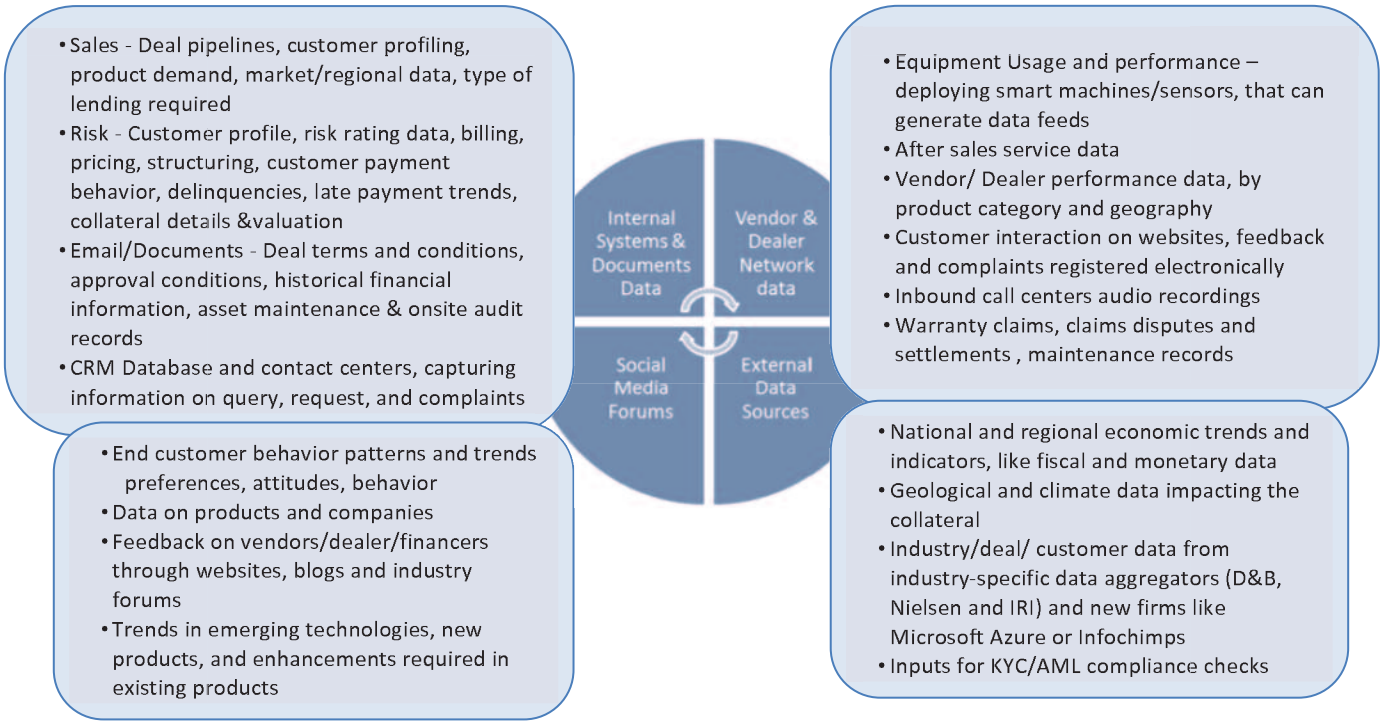
Data Availability

A recent IBM/University of Oxford study on Big Data in financial services found that initial Big Data efforts are focused on gaining insights from existing and new sources of internal data[8]. According to the survey, more than half of the banking and financial markets respondents reported internal data as the primary source of Big Data within their organizations. More than 80% of banking and financial markets respondents with active Big Data efforts were analyzing transactions and log data. This was machine-generated data produced to record the details of every operational transaction and automated function performed within the bank's business or information systems. This data had outgrown the ability to be stored and analyzed by many traditional systems and as a result, it was collected for years, but not analyzed.

[8]IBM Institute for Business Value in collaboration with Said Business School, University of Oxford: "Analytics: The real-world use of big data in financial services," Michael Schroeck and Rebecca Shockley

Figure 11 shows possible sources of Big Data (internal or external) for Equipment Finance businesses. In addition to the sources, a few important types of datasets are shared below. These could have a potential bearing on key business drivers that impact business objectives.

Figure 11 – Data Trends in Equipment Leasing and Finance



Sourcing Big Data from the above-mentioned sources requires strong analytical capabilities and technology infrastructure to be able to draw out meaningful insights, especially from unstructured datasets such as document texts, customer complaints and call-center voice recordings. As the IBM Survey noted, banking and financial services lag behind their cross-industry peers in *using more varied data types (such as social media data and voice recordings) within their Big Data pilots and implementations.* Most industry experts attribute this lack of focus on unstructured data to the ongoing struggle to integrate the organizations' structured data.

Challenges

Big Data vs. Practicalities

Writing for *The Wall Street Journal* in a *Journal Report* dated October 20, 2013, John Jordan discussed what might be referred to as the "nitty gritty" of Big Data. In essence, Jordan pitted Big Data's glamour and potential against the realities of working with and using Big Data. Among the questions and issues he raised:

- These are great tools, but who has the skills to use them?
- Big Data tools aren't ready for prime time: They are evolving rapidly, aren't taught in most universities, have less-than-ideal vendor support and require levels of user flexibility that more mature tools don't.
- If Big Data programmers and analysts don't understand the basics of the business for which they are programming, the data might not be useful and the company risks "running down a lot of expensive dead ends".

- A firm's bottom line might benefit from Big Data, but company executives must still be ready to manage the internal politics resulting from changed decision-making.
- Just because something can be measured doesn't mean it should be, and
- In some ways, Big Data requires an entirely new way of looking at the world.

Jordan cautions that unless industries and companies understand and deal with these challenges, they risk turning potential enhancements into "a diversion, an illusion or a paralyzing turf battle." Jordan believes businesses can profit from Big Data. But to do so, he says, managers "must refuse to get lost in the noise that can obscure the basic forces represented by customers, value and execution." One way to remain focused, Jordan adds, is to always insist on the basics of sound analytical practice. "Numbers can tell you things you never even knew to ask," he concludes. "But they never speak for themselves."

The Technology Landscape

Challenges exist not only in storage capabilities, but in the handling of complex data types. Fortunately, technology vendors have responded to these challenges. In general, these response technologies are not prohibitively expensive, and open-source platforms are the most popular. Of these, Hadoop is the most commonly used; it leverages commodity class hardware with open-source community-driven (mostly) free software. Some of the technology considerations for equipment leasing and finance firms are shared below:

Managing Legacy and New Technologies

Various parallel industries such as Banking and Insurance are slow in adopting new technologies, because the current technology landscape includes vast legacy systems and infrastructure. For all their impressive capabilities, the newly emerging Big Data technologies do require a skillset that is new to most IT departments. This can greatly slow adoption of such technologies. Equipment leasing and finance executives will have to figure out a way to integrate newly emerging Big Data technology paradigms (e.g., Hadoop) with legacy infrastructure (say, the IBM Mainframe, or Oracle BI platform) to take full advantage of the strengths of either platform.

Multiple and Complex Ecosystem

The complexity of the problem is exacerbated by the fact that Big Data tends to rely on a combination of multiple software applications, hardware and services that loosely constitute a computing ecosystem. The array of choices that have emerged in this arena can easily confuse or discourage new adopters from entering the fray. Companies such as IBM, EMC, HP, and SAP are working hard to tap this market by providing pre-configured big-data-in-a-box platforms (a.k.a., appliance frameworks). But much remains to be done to create the level of comfort necessary for aggressive enterprise-wide adoption of Big Data.

Big Data on the Cloud

While the pre-configured appliances are designed for on-premise deployment, companies such as Microsoft, Google, and Amazon are taking Big Data to the Cloud. Microsoft is offering the Hadoop Big Data paradigm integrated with Microsoft Azure, its proprietary Cloud computing infrastructure to enterprise customers. The combination would allow companies to move their own data into hosted big-data platforms, and deliver large scale analytics-on-the-cloud, all in a cost-effective and scalable manner. The solution is expected to be well-suited particularly to small and medium enterprises that are experiencing large computational and storage loads.

The Importance of Integrators and Connectors

A key success factor contributing to Big Data adoption is the development of connectors that enable disparate platforms and technologies to communicate with each other. Big Data vendors have been quick to grab this opportunity by building connectors that enable information exchange between the various databases, processing engines, and analytics and reporting applications. Connectors are now available not just for analytics and business intelligence tools, but also for commonly used enterprise systems, cloud-management suites, and even CRM applications.

Tools for Operationalizing Big Data Analytics

The proliferation of ever evolving data and algorithms to mine data poses a stiff challenge to the analyst who not only has to keep track of multiple algorithms, but also must expend significant development effort in experimenting with different algorithms. If such systems are to have truly broad impact, building and maintaining them needs to become substantially easier, so that Big Data Analytics can be rapidly operationalized for easy deployment across verticals. Next generation analytics platforms have already started to address these issues. Big Data Analytics platforms (such as Attivio, Splunk, and DataMeer) are increasingly evolving into one-stop shops that facilitate end-to-end analytics on large complex data using intuitive and easy-to-use user interfaces.

When selecting a Big Data vendor, firms should consider the following criteria:

- *Current offering:* The solution's architecture, data handling capabilities, discovery and modeling tools, algorithms, model deployment options, life-cycle tools, integration, extensibility and support for standards.
- *Strategy:* Core evaluation criteria include licensing and pricing; the quality of dedicated resources, R&D spending, the ability to execute their strategy and their solution road map.
- *Market presence:* Vendor's market presence, global presence, installed base, partnerships with other relevant software vendors (Software-as-a-Service (SaaS)/cloud/hosting providers, and Professional Services firms).
- *Vendors who would be enabling partners,* and play an important role in the creation and migration to the environment.

Conclusion

Big Data can reveal unknown and untapped behaviors and attitudes. In this Study, the direction is clear. Global business is quickly moving toward the use of Big Data, and many companies now using this technology have experienced positive trends in their profitability and customer satisfaction rates.

Before finalizing an investment in Big Data, however, it is essential that companies outline the objectives of such an implementation. As with any new technology or process, some companies will become early adopters. Others will take the wait-and-see approach. And still other firms may find that they simply have not accumulated sufficient data to analyze.

As noted in this Study, numerous research efforts indicate that Big Data's transformational effect is and will be most evident in the disciplines of product innovation and customer experience enhancement. Mindful of this, we believe now is the time to start collecting data—both structured and unstructured—and to determine the questions data scientists should address. Indeed, equipment leasing and finance companies would be wise to explore investing in an initial form of Big Data Analytics today, because going forward, such investments may not be optional.

Appendices

Appendix I: Glossary of Terms

Data Scientists

Data scientists generally analyze Big Data, or data depositories that are maintained throughout an organization or website's existence, but are of virtually no use as far strategic or monetary benefit is concerned. Data scientists are equipped with statistical models and analyze past and current data from such data stores to derive recommendations and suggestions for optimal business decision making.

Hadoop

Hadoop is a free, Java-based programming framework that supports the processing of large data sets in a distributed computing environment. It is part of the Apache project sponsored by the Apache Software Foundation. Hadoop was inspired by Google's MapReduce, a software framework in which an application is broken down into numerous small parts. Any of these parts (also called fragments or blocks) can be run on any node in the cluster.

Horizontal Big Data Platforms

These are technologies that are implemented across business functions irrespective of the activities performed by the divisions. A horizontal application takes the role of the foundation technology, on which each vertical can embed their customized IT requirements.

Machine-Learning Techniques

Machine learning is a type of artificial intelligence (AI) that provides computers with the ability to learn without being explicitly programmed. Machine learning focuses on the development of computer programs that can teach themselves to grow and change when exposed to new data.

Natural Language Processing

Natural language processing (NLP) is the ability of a computer program to understand human speech as it is spoken. NLP is a component of artificial intelligence (AI). The development of NLP applications is challenging because computers traditionally require humans to “speak” to them in a programming language that is precise, unambiguous and highly structured or, perhaps through a limited number of clearly-enunciated voice commands.

NoSQL

NoSQL is a type of data store; it's a way of storing and retrieving data quickly, much like a relational database except it isn't based on the mathematical relationship between tables as a traditional relational database does.

Rule-Based Systems

In computer science, a rule-based system is a set of "if-then" statements that uses a set of assertions, to which rules on how to act upon those assertions are created. In software development, rule-based systems can be used to create software that will provide an answer to a problem in place of a human expert. This type of system may also be called an expert system. Rule-based systems are also used in AI (artificial intelligence) programming and systems.

Structured Data Sets

Structured Data refers to an organized body of related information, which is normally structured and indexed for user access and review. Databases may exist in the form of physical files (folders, documents, etc.) or formatted automated data processing system data files.

Unstructured Data Sets

Unstructured data represents any data that does not have a recognizable structure. It is unorganized and raw and can be non-textual or textual. For example, email is a fine illustration of unstructured textual data. It includes time, date, recipient and sender details and subject, etc., but an email body remains unstructured. Unstructured data also may be identified as loosely structured data, wherein the data sources include a structure, but not all data in a data set follow the same structure.

Text Analytics

It is the process of deriving information from text sources. It is used for several purposes, such as: summarization (trying to find the key content across a larger body of information or a single document), sentiment analysis (what is the nature of commentary on an issue), explicative (what is driving that commentary), investigative (what are the particular cases of a specific issue) and classification (what subject or what key content pieces does the text talk about).

Appendix II: Big Data Analysis Models

Note: Not all of these shared techniques specifically require the use of Big Data. Some, such as A/B testing and regression analysis, can be effectively applied to smaller datasets.

A/B testing
Methodology in which a control group is compared with a variety of test groups in order to determine what treatments (i.e., changes) will improve a given objective variable, e.g., marketing response rate. This technique is also known as split testing or bucket testing.

Association rule learning
It is a set of techniques for discovering possible relationships, i.e., "association rules," among many variables in various large databases. These techniques comprise a variety of algorithms to generate and test possible rules.

Classification
A set of techniques to identify the categories in which new data points belong, based on a training set containing data points that have already been categorized. One mostly used application is the prediction of segment-specific customer behavior (e.g., buying decisions, churn rate, consumption rate) where the hypothesis or objective outcome is clearly defined. These techniques are often described as supervised learning owing to the existence of a training set; they stand in contrast to cluster analysis, a type of unsupervised learning. This technique is also mostly applied to mine data.

Data fusion and data integration
A pool of techniques that integrate and analyze data from various sources to develop insights in ways that are more efficient and potentially more accurate than if they were developed by analyzing a single source of data.

Ensemble learning
A supervised learning under which multiple predictive models (each developed using statistics and/or machine learning) are used to obtain better predictive performance than could be obtained from any of the constituent models. This is a type of supervised learning.

Genetic algorithms
A technique used for optimization that is inspired by the process of natural evolution or "survival of the fittest." As per this method, potential solutions are encoded as "chromosomes" that can combine and mutate. These individual chromosomes are selected for survival within a modeled "environment" that determines the fitness or performance of each individual in the population. Often described as a type of "evolutionary algorithm," these algorithms are well-suited for solving nonlinear problems. Examples of applications include improving job scheduling in manufacturing and optimizing the performance of an investment portfolio.

Network analysis
It is a set of techniques which are used to characterize relationships among discrete nodes in a graph or a network. In social network analysis, connections between individuals in a community or organization are analyzed to determine facts such as how information travels, or who has the most influence over whom. Application examples include identifying key opinion leaders to target for marketing, and identifying bottlenecks in enterprise information flows.

Optimization
A portfolio of numerical techniques used to redesign complex systems and processes to improve their performance according to one or more objective measures (e.g., cost, speed, or reliability).

Predictive modeling
It is a set of methods in which a mathematical model is created or chosen to predict the probability of an outcome.

Regression
It is a set of statistical techniques to determine how the value of the dependent variable changes when one or more independent variables are modified. Often used for forecasting or prediction.

Sentiment analysis
This includes application of natural language processing and other analytic techniques to identify and extract subjective information from source text material. Key aspects of these analyses include identifying the feature, aspect, or product about which a sentiment is being expressed, and determining the type, tonality (i.e., positive, negative, or neutral) and the degree and strength of the sentiment.

Signal processing
A set of techniques from electrical engineering and applied mathematics originally developed to analyze discrete and continuous signals, i.e., representations of analog physical quantities (even if represented digitally) such as radio signals, sounds, and images. This category includes techniques from signal detection theory, which quantifies the ability to discern between signal and noise. Sample applications include modeling for time series analysis or implementing data fusion to determine a more precise reading by combining data from a set of less precise data sources (i.e., extracting the signal from the noise).

Spatial analysis
A set of techniques, which analyze the topological, geometric, or geographic properties encoded in a data set. Often the data for spatial analysis come from geographic information systems (GIS) that capture data including location information.

Simulation
This involves modeling the behavior of complex systems, often used for forecasting, predicting and scenario planning. Monte Carlo simulations, for instance, are a class of algorithms that rely on repeated random sampling, i.e., running thousands of simulations, each based on different assumptions. The result is a histogram that provides a probability distribution of all the outcomes. Companies largely use this method to assess the likelihood of meeting financial targets given uncertainties about the success of various initiatives.

Time series analysis
Set of techniques from both statistics and signal processing for analyzing sequences of data points, representing values at successive times, to extract meaningful characteristics from the data. Time series forecasting is the use of a model to predict future values of a time series based on known past values of the same or other series.

Appendix III: Study Methodology and Purpose

The Big Data study commissioned by the Equipment Leasing & Finance Foundation focused on assessing Big Data around the following information areas:

- Overview of Big Data
- Business significance of Big Data in Equipment Leasing and Finance Industry
- Best Practices of Big Data applications in parallel industries
- Big Data Implementation and Adoption - Success Factors

The study involved desk research and expert interviews with Subject Matter Experts (SMEs) pertaining to Equipment Leasing and Finance Industry and Big Data Technologies. The interviews were conducted with senior level decision-makers and users of data within the targeted companies.

Shared below are interviewees/ target respondents' designations and the survey questionnaire.

Type of organization[9]	Number of interviews	Indicative Designations
Banking Group	2	Chief Executive Officer (CEO), Chief Information Officer (CIO)
Specialty Finance Business	2	Group Head Equipment Finance, Chairman and CEO
Captive Finance Businesses	2	SVP & Division Manager, Chief Operating Officer (COO)

Genpact, in consultation with the Foundation, selected relevant companies for the interviews and designed IDI (In Depth Interviews) to determine the perception and utilization of Big Data and analytics in the equipment leasing industry.

Indicative Questionnaire

Understanding on Big Data and its Adoption

Which business divisions of your organization use analytics extensively and why?

- What types of analytics applications are used by each of these divisions?
- What type of Big Data Analytics projects have been implemented by your organization?
- What business requirements prompted the need of using Big Data?
- Who are the key stakeholders involved in determining whether Big Data application should be installed?

Big Data Analytics – Future Prospects

- What are the key benefits and risks associated with adapting Big Data?
- Is Big Data Analytics a discretionary expense or going forward, is this concept going to become an integral part of the company's operations?
- How does the organization measure the ROI on Big Data?

[9]Six respondents from all three categories were a mix of big/medium and small enterprises from the US.

Big Data Implementation Process

- Can you elaborate on the Big Data implementation process and explaining in detail how each of the five steps of Big Data implementation cycle was covered?
  - o Data discovery
  - o Analytics discovery
  - o Tools and technology discovery
  - o Infrastructure discovery
  - o Implementation
- What are the key considerations involved in choosing the right Big Data applications and tools? Do they differ based on business requirements?
- What are most prominent types of Big Data applications and tools used?

Infrastructure & Investment

- Does adapting Big Data require additional investment, if yes, how much investment is required in terms of infrastructure, talent and time?
- What are the data sources used for implementing Big Data?
- To what extent is the data used is in unstructured format?
- Are there storage issues related to Big Data Analytics?
- On what basis do organizations select vendors to implement Big Data?
- What challenges did the team face while uploading the data sets and how were they resolved?
- Could you share with us extensive case studies of Big Data Analytics implementation by investment type (small, medium and large)?

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Appendix V: About the Authors

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