Understanding Your Big Data: An Intuitive Perspective

Background

Demands on Federal agencies to modernize legacy infrastructure by moving to cloud computing, provide transparency by making data available, and provide policy makers and the American public insight through the use of new data technologies is every increasing. Traditional data management tools, relational databases, and business intelligence software are insufficient to address the challenges of big data. Federal managers find themselves learning a new lexicon of file management and exploiting parallel computing to ask and answer questions that would have been inconceivable just a few years ago. This new data paradigm combined with emerging technology capabilities is creating both challenges and opportunities for IT departments.
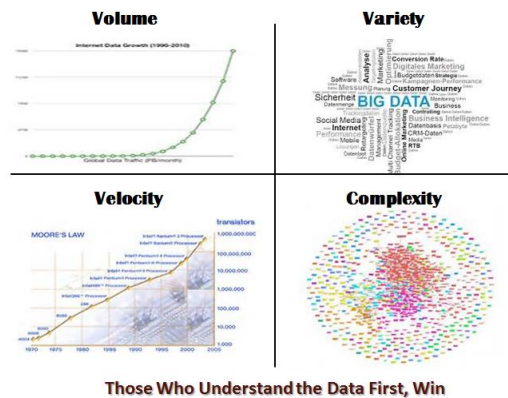
Understanding Your Big Data

Gartner defines big data as "… high volume, high velocity, and/or high variety information assets that require new forms of processing to enable enhanced decision making, insight discovery and process optimization". To that definition we added Complexity, to reflect the analytic and management challenge.

- **Volume.** Growth in big data is exponential because every organization is increasing the efficiency of their services, which triggers growth in the consumption and usage of the services, ultimately increasing the volume of the data. Thus, the growth of government big-data volume is circular and keeps increasing exponentially.
- **Velocity.** Moore's law assertion that computing power doubles approximately every two years continues to hold true. The capabilities of many digital electronic devices are strongly linked to Moore's law. Processing speed, memory capacity, sensors and even the number and size of pixels in digital cameras are all improving at this exponential rate.

- **Variety.** Gaining new insight by combining diverse data sets not traditionally viewed together is becoming the norm. Structured and unstructured data linked to traditional analytical data sets, opens a new world of analytical possibilities.

- **Complexity.** The ability to combine the elements large diverse data sets and perform increasing number of operations have results in an unprecedented level of complexity.

Those Who Understand the Data First, Win

Analytics

Big Data Analytics generally falls into the three categories of descriptive, predictive and prescriptive. The majority of Government analytics is focused on descriptive analytics. Cloud computing has provided a compute infrastructure that not only expands descriptive analytics, but makes possible predictive and prescriptive analytics.
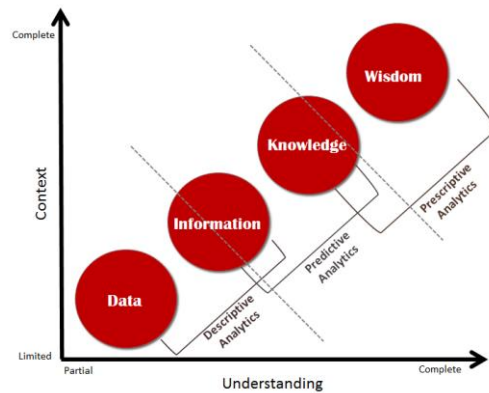
- **Descriptive Analytics.** Addresses the post-mortem perspective of what happened and why did it happen. Descriptive analytics looks at past performance and understands that performance by mining historical data to look for the reasons behind

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past success or failure. This is the focus of the majority of business intelligence implementations

- **Predictive Analytics** deals with extracting information from data and using it to predict trends and behavior patterns. Often the unknown event of interest is in the future, but predictive analytics can be applied to any type of unknown whether it is in the past, present or future. The emerging application of predictive analytics in the Public Sector includes:

  o *Fraud Detection*—leveraging compute on demand and data correlation using map reduce, to identify patterns of behavior that indicate fraud.

  o *Risk Management*—the application of statistical models, at scale, against multiple data sources to predict risk exposure levels.

  o *Customer Relationship Management*—the use of analytic tools against the corpus of data to understand and anticipate customer interactions.

  o *Decision Support Systems*— to develop decision logic or a set of business rules that will produce the desired action for every customer or circumstance. These models can be used in optimization, maximizing certain outcomes while minimizing others.

- **Prescriptive Analytics** synthesizes big data, mathematical and

computational sciences, and business rules, to make predictions and then suggests decision options to take advantage of the predictions. It uses modeling and simulation techniques to continually test hypotheses and recommend suitable courses of action. This enables a human to provide judgment via the application of computational power to filter large, complex data sets into a relevant context.

- **Data, Information, Knowledge, Wisdom.** This Knowledge Management model provides an overall context for the maturation of data and the appropriate analytic. Most Government organizations are in the lower right with aspirations to move into the middle.

Conclusion

The opportunities of Big Data can be realized through an abstracted understanding that simplifies the solution. Big data is not a re-boot but a natural evolution.

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