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Big Data Analytics for a Sustained Competitive Advantage

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Big Data Analytics for a Sustained Competitive Advantage

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ABSTRACT

Achieving a sustained competitive advantage in the industry is vital for a firm's long-term survival. Big data has been mentioned as a powerful competitive tool in the literature. This study examines the influence of big data analytics in achieving competitive advantage by a firm in its business operations. From a competitive advantage standpoint, big data analytics capability has implications for three key resources such as big data technology, big data technical skills, and data scientist skills. In this presentation we provide an overview of big data analytics in terms of resource-based view of the firm. Based on resource-based theory, we conclude that data scientist skills could be considered a driver to provide sustained competitive advantage. This study has implications for incumbent firms and new entrants who are heavily dependent of data-driven decision making to gain competitive advantage.

Overview

- Introduction
- Big Data Characteristics
- Literature Review
- Research Question
- Resource-Based View of Big Data
- Conclusion
- References

Introduction

- Big Data Analytics consists of advanced analytic techniques against very large data sets to uncover patterns, market trends, customer preferences, etc.
- Big data are mostly unstructured, generated in large volumes, and many cases data need to be captured in near real-time
- Big data has been identified as one of the key drivers for maintaining competitive advantage (McGuire et al., 2012; Panda, 2014; and Saran, 2014)
- Companies can use this data to know customers' interaction with their products and then quickly deliver according to customer wants and needs

Big Data Characteristics (Rahman & Aldhaban, 2015)

Characteristic	Description	Influencer
Volume	Grows from a few terabytes to hundreds of terabytes to petabytes of data that need to be captured, processed, stored and analyzed.	Data volume keeps growing faster in source.
Velocity	The data flows in today's digital era are being produced real-time and around the clock. Large volume of data needs to be captured real-time, stored, processed, and displayed faster for right time business intelligence and decision making.	Data flows in real-time and large volume. Improved computing, processing, BI & Visualization technologies.
Variety	Originates from a variety of data sources with unstructured, semistructured, and structured data. More than 90% data are unstructured.	RFID, Sensors, social networks, digital pictures, video, transaction records, and communication surveillance.
Veracity	In most cases data is unstructured and hence data consistency is an issue. Data and findings extracted from subjective comments and opinions are difficult to predict.	Data-based decisions require traceability and justification.
Value	Provides greater and new insights to generate business value.	Corporate business value; new and untapped business opportunities.

Literature Review

- Review of literature published in leading journals including
 - HBR, Journal of Management, MIS Quarterly, Strategic Management Journal, IEEE Proceedings, Industry white papers
- Strategic Management
 - Porter (1990, 2008), and Barney (1991)
- Competitive Advantage
 - Barney (1991), Woodruff (1997), Argote & Ingram (2000), Mata et al. (1995), and Akhter et al. (2014)
- Resource-based View of Firms
 - Wernerfelt (1984), Fahy (2002), Eisenhardt & Schoonhoven (1996), and Halawi et al. (2005)
- Big Data Analytics and Management
 - Devenport & Patil (2012), Kiron et al. (2013), LaValle et al. (2011), McAfee & Brynjolfsson (2012), Jelinek & Bergey (2013)

Research Question

- This research is based upon these questions:
 - (1) Can Big Data Analytics provide a sustained competitive advantage to a firm?
 - (2) What implication does Big Data Analytics capability have for three key resources such as Big Data Technology, Big Data Technical Skills, and Data Scientist skills?

Sustained Competitive Advantage

- Barney (1991) provides the definition of competitive advantage and sustained competitive advantage
 - “A firm is said to have a **competitive advantage** when it is implementing a value creating strategy not simultaneously being implemented by any current or potential competitors”
 - “A firm is said to have a **sustained competitive advantage** when it is implementing a value creating strategy not simultaneously being implemented by any current or potential competitors and when these other firms are unable to duplicate the benefits of this strategy”
- Academic and industry papers have cited benefits big data and capability of big data to provide competitive advantage (Saran, 2011; Lewotsky, 2014; Bell, 2013)

The Resource-based View of Big Data

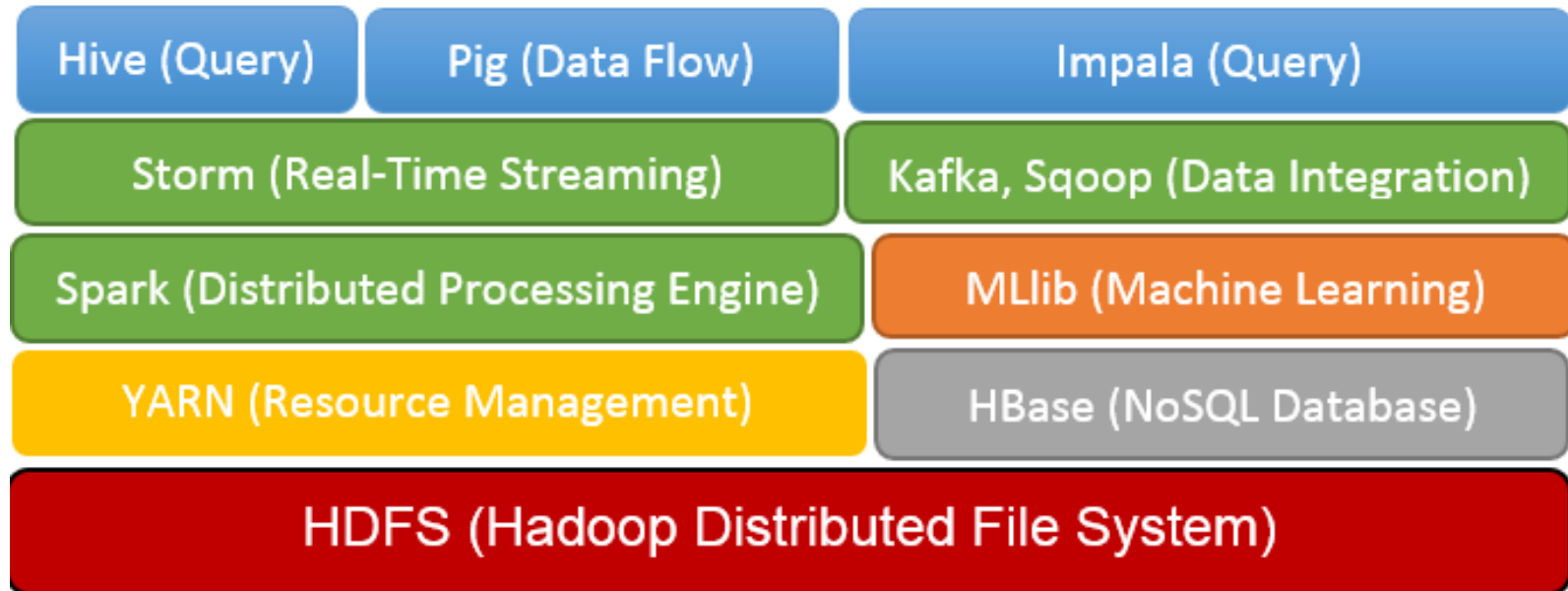
- The resource-based view assumes that firms are bundles of resources (Wernerfelt, 1984; Eisenhardt and Schoonhoven, 1996; Halawi et al. 2005)
- Resources mean strengths or assets of the firm that may be tangible (e.g., financial assets, technology) or intangible (e.g., reputation, data scientist skills) (Eisenhardt and Schoonhoven, 1996; Jelinek and Bergey, 2013)
- According to strategic management theory, the resource-based view of the firm also has two underlying assertions (Mata et al., 1995):
 - (1) that the resources and capabilities possessed by competing firms may differ (resource heterogeneity); and
 - (2) that these differences may be long lasting (resource immobility)

The Resource-based View (Cont'd.)

- Resource heterogeneity and resource immobility are the sources of sustained competitive advantage
 - If multiple firms possess the same resource it cannot help in attaining sustained competitive advantage
 - If a firm possess a resource but it could be acquired by other firms by developing or other means then that resource is mobile and hence cannot be a source of sustained competitive advantage
- There are certain attributes of big data which could be considered as possible sources of sustained competitive advantage of a firm
 - (1) Big Data Technology, (2) Technical Big Data Skills, and (3) Data Scientist Skills (which are key elements of big data)

1. Big Data Technology

- Big data technology consists of several software and tools
- These tools and technologies are open source mostly provided by Apache Hadoop Foundation
- Hadoop Components and Ecosystem (Rahman & Iverson, 2015):



1. Big Data Technology (Cont'd.)

- If a firm customizes and enhances these open source technology and software that might help a firm to be competitive
- But, does it make the firm to achieve sustained competitive advantage?
- IT applications are difficult to patent and even in most case they cannot be kept secret for a long time (Mata et al., 1995)
- Thus big data technology cannot be considered a source of sustained competitive advantage
- However, customization could provide that firm competitive advantage temporarily or it could give the firm a first-mover advantage

2. Technical Big Data Skills

- Technical skills refer to the know-how needed to build big data applications using the available technology and to operate them to make products or provide services
- These technical skills enable firms to effectively manage the technical risks associated with products and services (Mata et al., 1995)
- Research suggests that there are some barriers in implementing big data. One of the most prominent barriers is inadequate skills set (Russom, 2013)
- To work in big data space as a developer a new skill set is needed (Davenport and Patil, 2012)
 - A strong programming background such as in Python, Java, JavaScript, Machine Learning, Shell scripting, and data visualization tools

2. Technical Big Data Skills (Cont'd.)

- Can attainment of training and skills of big data make a firm achieve sustained competitive advantage?
 - Many firms can have their current IT workforce get trained or even employ recent college graduates who are trained on latest tools, technologies and programming languages
 - Some firm can even hire technical consultants in big data space to get required applications built
- Thus big data technical skills cannot be used as a source of sustain competitive advantage
- However, for a short time "organizations can derive competitive advantage by transferring knowledge internally while preventing its external transfer to competitors" (Argote and Ingram, 2000)

3. Data Scientist Skills

- The data scientist need to play role in building big data domain, requirements analysis, design, development of the applications for data exploration, and discovery analytics to get full value from big data
- Data Scientist is responsible for deriving intelligence from data and translate that into business advantage
- In big data analytics, examples of important data scientist skills include
 - Understanding of how to leverage analytics for business value
 - Work with these functional managers, suppliers, and customers to develop appropriate big data applications
 - Coordinate activities in ways that support other functional managers, suppliers, and customers

3. Data Scientist Skills (Cont'd.)

- Successful data scientists need understanding of business along with suppliers and customers
- They need to build strategic alliance with suppliers and customers
- They need to build a domain knowledge over longer periods of time through the accumulation of experience by trial and error learning and most cases learning by doing (Mata et al., 1995)
- They need to build friendship, trust and interpersonal communication both vertical and horizontal
- This takes years to develop such relationships

3. Data Scientist Skills (Cont'd.)

- Data scientist skill development takes a longer period of time; interpersonal communications and trust building take a long period of time, and this data scientist skill is quite complex
- This skill will vary from business organization to business organization
- Hence, Data scientist skills are valuable and heterogeneously distributed across firms
- Thus this skill could be a source of sustained competitive advantage

Conclusion

- We reviewed Big data sustained competitive advantage possibility based on resource-based view of the firm
- Three key attributes of big data analytics include big data technology, big data technical skills, and data scientist skills
- Data Scientist Skill appears to be a possible source of sustained competitive advantage
- Big data is not just owned by IT department. It needs to be driven and owned by data scientists as well as business managers

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