

## A Framework for Boosting Revenue Incorporating Big Data

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**Abstract.** Complex industry partnerships, innovative strategies, and cross-cutting industry competition, challenge business leaders in making strategic and operational decisions that support growth and competitiveness. Companies seeking to inform their business decisions by leveraging “big data” face challenges in processing and analyzing such large and rapid datasets. However leveraging big data can create value for businesses. Although various frameworks exist for implementing analytics, few accommodate the implementation of big data analytics. Our goal is to develop a framework by studying big data on a micro and macro level and examining how companies can use big data to boost revenue through creating value. This research is augmented by an in-depth examination of industry giant Amazon.com. Our results provide a framework that enhances traditional analytical frameworks through the integration of big data analytics. Our findings indicate that an integrated framework provides enhanced insights to decision makers seeking to create value for their businesses.

**Keywords.** Big Data, Information Analysis, Innovation, Business Management.

### 1 Introduction

Business leaders face many challenges in establishing and maintaining a competitive advantage in today’s fierce and cross-cutting industry. In order to develop ways of differentiating from competitors, while creating business value, business leaders traditionally develop strategies by assessing the business’ operational environment along with the capabilities and resources of the company (Harvard Business School, 2006). Advancements in technology and management approaches, such as Business Intelligence Systems and Six Sigma programs, have allowed business leaders to make more informed decisions through the use of data analytics and tools that integrate performance metrics, scorecards, and management reporting (Davenport, 2006). However, as technology continues to advance, the of sheer volume of information generated, variety of sources data is generated from, and velocity in which data is generated, pose challenges for businesses that seek to capture, store, manage, and analyze data that is both large in scope and scale. Giving rise to the term “Big Data”, technological advancements have paved the way for data to grow exponentially on a

global scale through the introduction of new capabilities and mobile devices such as high definition video, smartphones, tablets, GPS, social media, and the “Internet of things” (Gobble, 2013; Fosso Wamba et al., 2014).

### 1.1 Big Data

According to Gobble (2013), the term “Big Data” refers to the case of having extremely large data sets that require innovative methods in the collection, storage, organization, analysis and sharing of such data. More broadly, big data refers computer network data that cannot be adequately managed and processed through commonly available software and databases due to the enormous rate and size of its production along with its unstructured nature (Manyika et al., 2011; Gobble, 2013; Dewey, 2014). The collection and interpretation of big data is accomplished through strong computing ability that actively engages many digital data streams and uses algorithms to analyze the data in search of meaningful and useful correlations (Davenport, 2014). Key sources of big data include public data, private data, data exhaust, community data, and self-quantification data (George et al., 2014).

The subject of big data has captured the attention of academic researchers and business practitioners alike due to its reported potential for creating business value. Research suggests that the ability to capture and analyze big data efficiently and effectively can lead to the extraction of market and business insights that create business value through the creation of new products and services and also can create value across the global economy through improved competitiveness and productivity. Applying analytics to big data enables companies to create entirely new business models, develop new products and services, improve products while they are in use, and tailor offerings to meet the needs of specific market segments (Manyika et al., 2011; Fosso Wamba et al., 2014;). While traditional analytic approaches often assume stability by focusing on making decisions around exceptions, big data analytic approaches accept a continuously changing environment and focus on the ability to recognize change and react quickly. Smaller data sets associated with traditional analytics sets are known for their use in generating reports that support internal strategic decisions with respect to inventory, price structure, customer base, and offerings to customers. On the other hand, big data analytics uses continuous data sampling to provide additional insights that further enhance strategic decisions and may assist business leaders in identifying new business opportunities, which may also include customer-facing interfaces (Davenport, 2014).

Creating and delivering customer value is at the core of any business strategy and requires research to provide value propositions consistent with customer expectations and needs. Therefore, businesses need gain insights into customer behavior, preferences, and the products or services that customers purchase and use. Understanding the customer’s perceived value, the ability to forecast future value perceptions, and the capability to address unique customer requirements are central elements in developing and sustaining a competitive advantage (Nicola et al., 2014). The customer value assessment model proposed by Nicola et al. (2014) provides a quantitative approach for comparing value proposition to customer needs and internal and/or external tangible or intangible assets. The incorporation of big data capabilities can further enhance such approaches through rich data sources and advanced

computational capabilities that provide additional insights across a value network along with real time identification and tracking of key factors in determining customer value perceptions. Harasim & Klimontowicz (2013) recognize the fundamental relationship between the diffusion of innovation and customer habits in the retail payment market. User behavior was identified as a critical driver for innovation, and future business strategies are expected to focus increasingly on customer-driven innovation. As customer needs and expectations shift toward real-time payments, ease of use, predictability, and e-payments (Harasim & Klimontowicz, 2013), technologies associated with big data capabilities can assist in meeting such changing customer requirements by providing businesses with key insights derived from customer behavior and trends. For example, Amazon.com uses customer data to provide their customers with suggestions on merchandise they may be interested in on their website by indicating “recommendations for you” or “customers who bought this item also bought”. Also, customers can rate products and post reviews in terms of their satisfaction level which can assist Amazon in making internal decisions on its product offerings (Amazon.com, Inc., 2015). Pricing optimization can further be enhanced through the incorporation of external big data associated with influences on consumer demand and competitor prices. Automated algorithms can even adjust prices automatically in response to particular events or trends. Big data analytics may also be extended to other traditional analytics for assessing supply chain risks. Supply chain decisions may be enhanced by leveraging external big data on a company’s suppliers and even their suppliers’ suppliers with respect to their capabilities, financial standing, quality, reliability, reputation, and practices. Big data can also further enhance traditional market and competition analyses by uncovering new competitive factors and using much more encompassing data sets for trend analysis, benchmarking, and segmentation for deriving strategic alternatives. Management practices for the use of big data in internal decision making have not fully been resolved due to the constant influx of data and lack of establishing decision criteria and timeframes for fluctuating analysis outputs (Davenport, 2014).

Estimates reveal that 1 in 3 business leaders do not trust the quality of the information used in the decision making process (Fosso Wamba et al., 2014). However, additional operational insights, efficiency gains, and enhancements to decision making processes are possible through the use of real-time performance data and automated algorithms (Manyika et al., 2011). Academic and industry research indicate that retailers that apply big data analytics stand to realize a return on investment of up to 20% (Fosso Wamba et al., 2014) and improve operating margins by at least 60% (Manyika et al., 2011). However, businesses struggle to incorporate big data analytics into their practices due to lack of infrastructure, analytic skills, trust, and understanding. In 2011, only 25% of the manufacturing industry leaders believed that digital technologies would significantly affect their businesses and was observed to possess insurmountable quantities of data that were never utilized for creating value. And in 2013, 56% percent reported that their companies had not made significant progress in implementing big data projects (Dutta & Bose, 2014).

Research indicates that companies rarely make use of their innovative data and those attempting to put big data analytics into practice can become overwhelmed and are unable to extract any insights of use. Although big data technologies currently exist, a

consensus on tools and techniques for managing and using big data to extracting valuable insights is not well established (Gobble, 2013). However, as customer needs shift toward more personalized and custom services that are compatible with the technology platforms that these customers use, insights achievable through big data analytics become increasingly important in identifying specific customer needs along with the innovative capabilities of a businesses to meet these needs (Harasim & Klimontowicz, 2013). Companies are currently trying to gain a better understanding of big data analytics and the associated benefits through pilot projects or the development of a strategy for incorporating big data into their practices (Dutta & Bose, 2014). In addition, there is reportedly a significant shortage in people with skills to perform in depth analytics and managers to make use to such analytics (Manyika et al., 2011; Gobble, 2013).

Scholarly frameworks that integrate the use of big data have not yet been resolved and continue to be of interest to researchers (Dutta & Bose, 2014). Few publications address big data opportunities for introducing new scholarly management tools, practices, and theories. Rather than relying on limited data such as quarterly and annual reports, a shift toward a micro-perspective that incorporates big data can assist scholars in the assessment of business cases, along with the evolution of strategies, practices and behaviors, virtually real time (George et al., 2014).

The following sections provide a description of four different tools, frameworks, and analysis methods commonly used in case study, business analysis, and decision making and include the SWOT analysis, business model, matrix of change, and the strategy map coupled with the balanced score card. These tools, frameworks, and analysis methods form the foundation for the subsequent sections of this paper which contrast the application of traditional analytic techniques with the application of big data analytics in the case of Amazon.com. In addition, we propose a framework that integrates these well-known management tools and frameworks with big data analytics to create a cohesive methodology for the purpose of helping businesses boost their revenue.

### 1.2 SWOT Analysis

SWOT (Strengths, Weaknesses, Opportunities and Threats) is a tool, developed by Harvard Business School during the 1960's, for finding, collecting, understanding and evaluating internal and external data. As shown if Figure 1, the data is based on four categories: Strengths, Weaknesses, Opportunities and Threats.

<p><b>Strengths</b>                  1. Consider internal information.</p>	<p><b>Weaknesses</b>                  1. Consider internal information.</p>
<p><b>Opportunities</b>                  1. Consider external information.</p>	<p><b>Threats</b>                  1. Consider external information.</p>

Fig. 1. SWOT Analysis.

The SWOT analysis is one of the most frequently used tools to analyze strategies. Its simplicity and flexibility makes this tool widely used (Al-Araki, 2013). When building a SWOT analysis internal information should be used when considering strengths and weaknesses. On the other hand, external information should be used when considering opportunities and threats.

### 1.3 Business Model

The business model is a great tool that summarizes the business for the purpose of obtaining the right strategies. “Business models are clearly related to strategy” (Bertels et al., 2015, p.2). It directs the implementation of strategy at a specific point in time and by using it we can analyze the innovation through the business model lens. The business model is a holistic concept where all the three essential innovation lens are presented: technology, value network, and economics (Bertels et al., 2015). Figure 2 depicts a business model framework along with several questions that should be answered when designing a business model (Osterwalder and Pigneur, 2010).

<p><b>Key Partners</b> Who are the key partner and suppliers? Which key resources are acquired from partners and Which key activities are performed by partners?</p>	<p><b>Key Activities</b> What key activities do the value propositions, distribution channels, customer relationships and revenue streams require?</p>	<p><b>Value Proposition</b> What core value is delivered to the customer? Which customer problem is addressed? Which customer needs are satisfied? What products and services are offered to each customer segment?</p>	<p><b>Customer Relationships</b> What relationship does the customer expect? Which have been established, how costly are they, and how are they integrated with the model?</p>	<p><b>Customer Segments</b> What group(s) of people or organizations are served? Who is value created for? Who are the most important customers?</p>
<p><b>Key Resources</b> What key resources do the value propositions, distribution channels, customer relationships and revenue streams require?</p>			<p><b>Channels</b> How are customer segments reached? How are channels integrated, which ones work best, and which are most cost effective?</p>	
<p><b>Cost Structure</b> What costs inherent in the business model are the most important? Which key resources and key activities are the most expensive?</p>		<p><b>Revenue Streams</b> For what value are customers willing to pay, what and how do they pay and prefer to pay? How much does each individual revenue stream contribute total revenues?</p>		

Fig. 2. Business Model.

Notably, the business model is a generic platform to tie the strategy with practice, describing the design or architecture the value creation, delivery, and capture mechanisms of a firm (Ritala et al., 2014).

### 1.4 Matrix of Change (MOC)

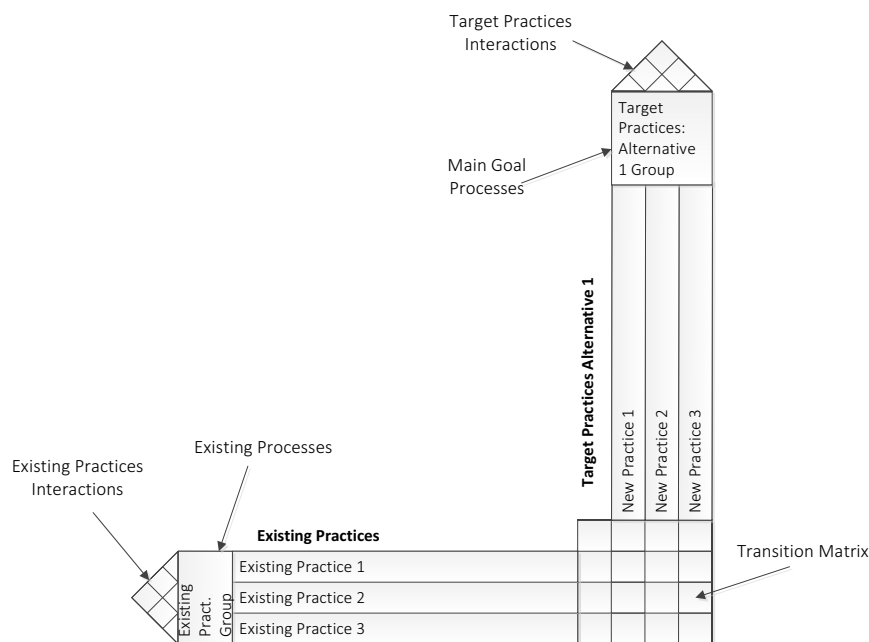
The MOC can help businesses to assess and understand the difficult interrelationships in strategy change, feasibility of a new system of practices, and the sequence of practices to be changed (Brynjolfsson & Renshaw, 1997).

Elattar (2014) identified the significance of the MOC in that “It is important to remember that the Matrix of Change does not actually provide a solution to problems in transitional management; rather it paints a picture of the transition process and allows stakeholders to better understand the sort of undertaking that will be required for a successful transition” (p. 96).

The MOC is “a visualization tool for capturing the existing and desired states of the proposed change, the complementary and opposing practices and how best to proceed in the implementation of the change” (Massachusetts Institute of Technology and the Center for Coordination Science, 2015).

As shown in Figure 3, three matrices construct the MOC as follows:

- The horizontal matrix (the current existing practices),
- The vertical matrix (the target practices) and
- The transition matrix, which are interactions among processes.

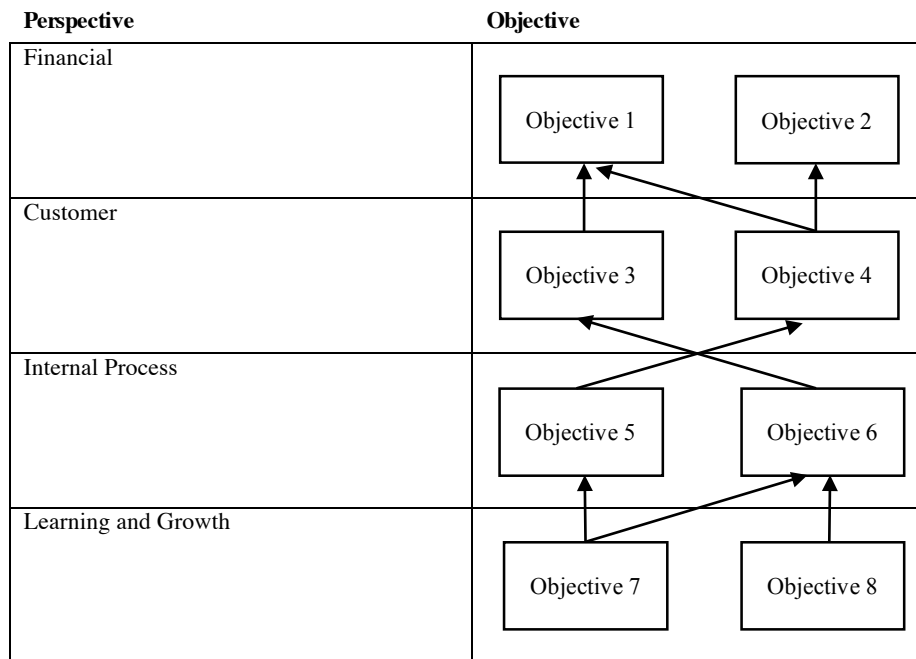


**Fig. 3.** Matrix of Change (MOC) (Elattar, 2014).

By mapping current practices to the desired future practices through their process interactions, the MOC provides an understanding of how difficult change may be and helps in the formulation of strategies for dealing with such change.

**1.5 Strategy Map & Balanced Scorecard (BSC)**

A strategy map is at the core of formulating a strategy and identifying primary strategic objectives. As depicted in Figure 4, a strategy map accounts for competitive factors through multiple perspectives including financial, customer, internal process, and learning and growth. Further, the strategy map allows any linkages between objectives to be visually depicted.



**Fig. 4.** Strategy Map.

A framework to measure the progress for any organization is highly desirable in assessing success. The balanced scorecard (BSC), shown in Table 1, is a measurement tool with the goal of encouraging businesses to measurement their strategies. The significance of the BSC is that many firms develop strategies without a basis for evaluating, measuring and monitoring their success. More than 50% of the Fortune 1000 use a BSC (Nair, 2004).

**Table 1.** Balanced Scorecard

Perspective	Objective	Measures	Targets
Financial	Objective 1	How to measure.	Quantify goal.
	Objective 2	How to measure.	Quantify goal.
Customer	Objective 3	How to measure.	Quantify goal.
	Objective 4	How to measure.	Quantify goal.
Internal Process	Objective 5	How to measure.	Quantify goal.
	Objective 6	How to measure.	Quantify goal.
Learning and Growth	Objective 7	How to measure.	Quantify goal.
	Objective 8	How to measure.	Quantify goal.

Consistent with the strategy map, the BSC has four perspectives: learning and growth, the internal processes, customer value, and financial perspective in which the measurement metrics are constructed (Callado & Jack, 2015). In a BSC, a SMART methodology (specific, measurable, assignable, realistic, and time-related) should be applied (Yuanhong et al., 2015).

## 2 Methodology

Our research of case studies and scholarly literature indicates there is a gap between existing frameworks and the integration of big data analytics in case analysis and strategic decision making. There are many scholarly works that provide concepts and frameworks for achieving various management functions and objectives, however more integrated frameworks that provide steps that companies should implement to realize their full potential through the incorporation of big data analytical techniques are scant.

While authors such as Kaplan & Norton (2001) and Hamel (2002), introduce strategic concepts and tools that address innovation, such as innovative business models, strategy maps, balanced score cards, and profit boosting techniques, the incorporation of big data for enhancing these practices has not yet been addressed. Academic compositions such as those for decision analysis (Clemen & Reilly, 2014) and quality management (Evans & Lindsay, 2014) have not yet addressed the use of big data for growing such capabilities. Works that address technical endeavors associated with engineering activities have not yet addressed ethical issues as a consequence of implementing big data techniques (Martin & Schinzinger, 2005) or the management of engineering and technology as it applies to the use of big data (Morese & Babcock, 2014).

Many researchers such as Brynjolfsson & Saunders (2010), Deighton & Kornfeld (2013), Sahoo, et al. (2014) acknowledge blurred lines between industries, technology convergence, along with platforms and architectures needed for today’s digital ecosystems. Other researchers focus on a particular aspect of big data such as data mining (Matsudaira, 2014; Kusiak, 2015) or data-driven marketing (Pousttchi & Hufenbach, 2014). Research conducted by Gobble (2013), Davenport (2014), and Dutta & Bose (2014) have established linkages between the practical use of big data to



support strategic decision-making, project management, and innovation. However linkages to integrated frameworks and steps for practical implementation of big data analytics are only in the beginning stages of development, are in short supply in the literature, and deserve further development.

We propose a business enterprise framework for boosting revenue that incorporates the use of big data analytics. The development of our framework began with a review of the literature to identify concepts, frameworks, and methodologies relevant to business case analysis, business solutions, and management practices. In addition, the literature was reviewed to identify case studies and research specific to the collection, storage, analytics, and use of big data. A synergistic approach was used to derive a framework that outlines practical steps for implementing big data capabilities that create value.

To validate the framework, we performed a detailed case study of Amazon.com, across all of their operating segments, in order to provide an understanding of how the company uses big data analytics in providing top customer satisfaction and top sales in the online retail industry. Our case study was informed using publically available information regarding Amazon, their competitors, and global market trends, much of which were in the form of annual, quarterly, stock, and market reports. Our case analysis approach was performed in two steps. First, traditional management tools were used consistent with our framework to assess the company as a whole and each of their operating segments. The second step synergized our review of literature and Amazon's big data capabilities to overlay the use of big data analytics onto the management tools from our framework for the purpose of enhancing traditional methods of analysis. In addition, a panel of fifteen experts from academia (engineering management, computer science, industrial engineering, and business), professional and consulting management, and global online retail, spanning the United States, Latin America, Europe, Asia, and the Middle East, evaluated and validated our framework. This expert panel consisted of individuals experienced in the subject matters (i.e., big data and strategy). The practice included an evaluation questionnaire and individual interview sessions. The evaluation questionnaire consisted of using the case study and the framework to evaluate its consistency and uniqueness. The experts were also interviewed (individually) after the evaluation session. The results were analyzed and incorporated into the framework. Our framework compliments the framework provided by Dutta & Bose (2014) for implementing a big data project. We focus on augmenting traditional analytical tools and methods with big data analytics for better informed decisions that lead to value creation.

## **2.1 Proposed Framework**

The framework shown in Figure 5 uses well-known management tools along with big data analytics to create an integrated methodology for the purpose of helping businesses boost their revenue. The uniqueness of this contribution is performing the framework in sequential processes to guarantee a great result.

The first phase of the framework studies the situation or case by assessing the operational environment and company capabilities. This phase is accomplished through the SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) and the business model, and requires data and information from external and internal sources. The external sources support the development of the opportunities and threats (e.g.,

technological trends). The internal sources (e.g., financial performance) support the development of the strengths and weaknesses. Big data is a mix of structured, semi-structured, unstructured, and streaming data. Therefore, this phase needs tools that scan the data looking for emerging issues while finding factors that could affect current performance, competitor information, and market information. Tools that emphasize clustering, data mining, and predictive analytics for structured data are able to improve search procedures and identify relationships. For unstructured data, mechanisms are needed for enhancing documentation descriptions and labeling along with enabling search operations such as network analyses. The results from the SWOT analysis helps to inform the company's business model and strategic objectives for how a company generates value and competes differently.

The second phase consists of using the MOC in order to plan the diffusion of change. The utilization of big data and analytics are very important in order to validate the transition matrix and the desired future state. Therefore, the capability of the tools must support risk modeling. Predictive analytics utilizing powerful machine learning paradigms, along with data mining integrated with simulation analytics (Rabelo et al., 2007) offer good foundations for risk modeling. Risk modeling provides justification for the transition matrix along with the corresponding strategies and operational executions with respect to the degree of change, levels of feasibility, order or sequence, and level or consistency of the pace.

The third phase employs the Strategy Map and BSC to provide metrics for measuring performance and determining the best projects through the alignment with strategies that generate an improved and sustainable financial income. Social Analytics and Business Intelligence with transactional data, are able to support the development of schemes to measure performance. In addition, real-time analytics is an important mechanism for enabling customer engagement to be captured from different sources such as mobile apps, digital ads, sensor networks, and web sessions. This flow of information can inform dashboards that help executives visualize performance measures associated with various organizational initiatives (i.e., projects).

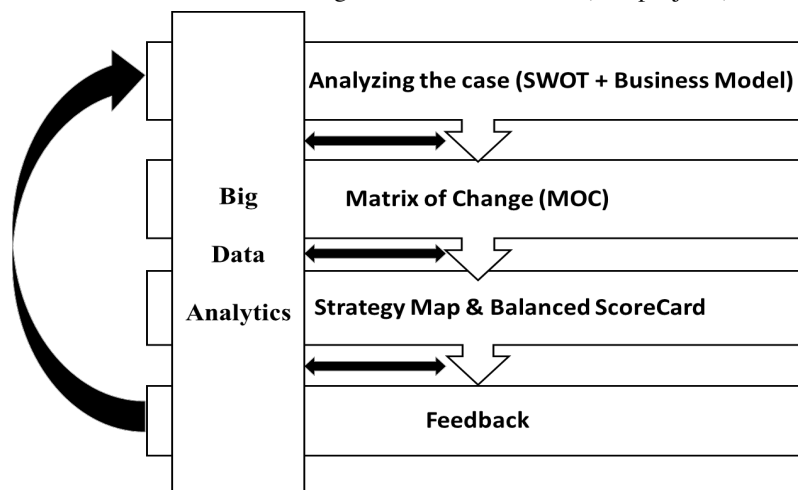


Fig. 5. Revenue Boosting Framework.

In all the phases, the big data analytics methodology will be used to make sure that all analyzing tools are based on informed, authentic and reliable data. The big data analytics methodology will be accomplished for many purposes such as enhancing sales predictions and better matching of products to customers. Finally the feedback of all the framework processes will be closely studied and evaluated for the purpose of making the right decisions in the future decisions. The detailed figures in the subsequent sections show the specific analytical techniques applied to each step within the proposed framework using Amazon.com. The exact techniques depend on the company's goals, objectives and practices which is why we demonstrate the use of our framework for a specific company, Amazon.com, in the subsequent sections.

## **2.2 Framework Applied to Amazon.com**

Amazon.com, Inc. serves consumers, sellers, content creators, and enterprises through their websites and web services. As an online retailer in the Catalog & Mail Order Houses industry and Services sector, two operating segments exist; North America and International. The company's primary source of revenue consists of sales from a variety of products and services to customers. Gross revenue consists of product sales from inventory, while the net share of revenue consists of service sales of items sold by other sellers. Sales are affected by seasonality, and are historically higher during the fiscal year fourth quarter, which ends December 31 (Amazon.com, Inc., 2014; Amazon.com, Inc., 2015).

Several platforms are provided for third-party retailers, marketing and promotional services, and web services for developers, publishing, digital content subscriptions, and advertising services. Amazon Web Services (AWS) serves business customers from data center locations in the U.S., Brazil, Europe, Japan, Singapore, and Australia. Manufacturing and sales of electronic devices include Kindle e-readers, fire tablets, fire TV, echo, and fire phones (Amazon.com, Inc., 2014). International websites include Australia, Brazil, Canada, China, France, Germany, India, Italy, Japan, Mexico, Netherlands, Spain, and the United Kingdom. Other operated websites include [www.a9.com](http://www.a9.com) and [www.alexa.com](http://www.alexa.com) for search and navigation, and the movie database [www.imdb.com](http://www.imdb.com) (Amazon.com, Inc., 2015).

Amazon has developed and expanded their infrastructure and big data analytic capabilities over many years. As the market reach and customer base grows, so does the amount of data available for analysis. Insights are regularly extracted from customer data due to highly developed data management and analytic capabilities, along with an infrastructure that is both flexible and scalable. A variety of technologies, networks, and tools are implemented in support of real time analytics and productivity management that promotes customer satisfaction and revenue gains. These capabilities are currently being extended to customers through services for digital storage, cloud computing, business enterprise solutions, and big data solutions. Table 2 provides brief descriptions of the company's AWS big data analytics options (Amazon.com, Inc., 2015).

**Table 2.** Amazon Web Services (AWS) for Big Data Analytics

<b>Analytics Option</b>	<b>Description</b>
Amazon Redshift	Used for analyzing global sales across product mixes, add clicks and impressions, social trends, along with the storage of historical stock market data and the aggregation of gaming data. Measures are provided for quality, operational efficiency and financial performance. Amazon Redshift is also compatible with many business intelligence systems and is designed for data warehouse workloads with structured data. Unstructured data may be prepared and structured for Amazon Redshift through the use of Amazon Elastic MapReduce.
Amazon Kinesis	Used in processing real-time stream data for analysis. Stream data may be rapidly moved from data sources and continuously processed. Data may be transformed and redistributed, analyzed real-time, or decomposed and aggregated across data streams. Amazon Kinesis enables real-time analytics such as customer engagement and website clickstream. Since data is not batched application logs can be pushed directly to an Amazon Kinesis stream for processing. Data processed by Amazon Kinesis may be used in the extraction of metrics and generation of key performance indicators that feed real-time reports and dashboards. Data may be moved and stored through Amazon S3, Amazon Glacier, Amazon Redshift, or Amazon DynamoDB.
Amazon Elastic MapReduce	Uses Apache Hadoop for providing a framework for running big data processing and analytics through the distribution of data sets across compute nodes in a Hadoop cluster. The capability is typically used in risk modeling and analytics for threats, ad targeting and click stream, genomics, prediction, and ad-hoc data mining.
Amazon DynamoDB	Stores and retrieves large amounts of data with millisecond latency and is integrated with other services. This capability is commonly used for mobile apps, gaming, digital ads, sensor networks, online shopping carts and managing web sessions.
Amazon Machine Learning	Uses algorithms to find patterns in data for creating machine learning models used in predictive analytics. Predictions may be real-time or scaled. This technology can be used to build predictive models for detecting fraud, recommendations to customers based on prior actions, targeted market campaigns, automatically structuring information, identifying customer attrition risks and mitigations, and a variety of automated solution recommendations.

We focus on applying big data techniques to the business case of Amazon.com (Chen & Zhang, 2014) to demonstrate that implementing big data analytics yields more accurate analysis results compared to more subjective and traditional business analysis methods. For optimization techniques, algorithms may be applied for optimization criterion that reflect the goodness. Statistical techniques are used in identifying correlations and causal relationships between different objectives. Data mining is a technique consisting of information extracted through pattern recognition and involves machine learning and statistics. Machine learning refers to the use of artificial

intelligence to design algorithms that allow computers to evolve behaviors based on data. This technique discovers knowledge and makes intelligent decisions automatically. Visualization techniques assist with depicting data in an understandable way such as through the use of tables, images, and diagrams. And lastly, social network analysis examines social relationships for social network, media mining and analysis, along with human behavior modeling.

**2.2.1 Amazon SWOT Analysis**

A SWOT analysis is performed to evaluate Amazon’s strengths, weaknesses, opportunities, and threats in order to better inform subsequent strategy formulation and recommendation activities. Much of the SWOT analysis was derived from publically available financial statements and annual reports for Amazon and their main competitors. The results of the SWOT analysis are shown in Figure 6.

<p><b>Strengths</b></p> <ol style="list-style-type: none"> <li>1. Top customer satisfaction in online retail.</li> <li>2. Top sales in online retail.</li> <li>3. Large regional span with incremental market development.</li> <li>4. Innovative and wide range of products and services that span multiple markets.</li> <li>5. Integrated products and services such as Prime subscription that provides the customers many services as a bundle.</li> </ol>	<p><b>Weaknesses</b></p> <ol style="list-style-type: none"> <li>1. Low net income 2008-2011, and net income loss in 2012 indicates that Amazon is not profitable. Even though net sales have increased year over year, reaching \$61 billion in 2012, Amazon’s operating expenses account for 99% of net sales.</li> <li>2. Slowing sales and growth rates in mature and saturated markets such as the US and the UK.</li> <li>3. High debt – 67.8%.</li> </ol>
<p><b>Opportunities</b></p> <ol style="list-style-type: none"> <li>1. International e-commerce and mobile device markets are emerging given the appropriate price points and access.</li> <li>2. Online purchases using mobile devices are growing.</li> <li>3. Industry technology and capabilities are becoming more and more interconnected.</li> <li>4. E-books sales exceeded paper book sales.</li> <li>5. Increasing demand for smartphones and tablets; opportunity to increase tablet market share and enter the smartphone market.</li> <li>6. International expanding into developing/emerging markets to boost the sales growth in comparison with mature markets like the US with slower growth.</li> </ol>	<p><b>Threats</b></p> <ol style="list-style-type: none"> <li>1. The competition from industries that have more resources and better performing products such as Apple, Google, and Microsoft.</li> <li>2. The competition from Apple’s iBook store in the e-book market.</li> <li>3. Apple’s iTunes store is gaining more market share in the multimedia market.</li> <li>4. The market demand for owning media is significantly declining due to available streaming.</li> </ol>

**Fig. 6.** Amazon SWOT Analysis.

Information that is considered internal to Amazon is used in the derivation of their strengths and weaknesses. On the other hand, information external to Amazon is used to derive relevant opportunities and threats. In addition, often weaknesses and threats can reveal opportunities that can be acted upon.

**2.2.2 Amazon Business Model**

Using the business model methodology provided by Osterwalder and Pigneur (2010), a business model framework was derived for Amazon and is shown in Figure 7. Publically available financial statements and annual reports were used to derive much of Amazon’s business model.

<p><b><u>Key Partners</u></b></p> <p>UPS Publishers Suppliers Manufacturers America Online Yahoo! Excite Netscape GeoCities Alta Vista @Home Prodigy</p>	<p><b><u>Key Activities</u></b></p> <p>Online Trading Design Productions Investing Financing</p> <p><b><u>Key Resources</u></b></p> <p>Human Resources Inventories Suppliers Partnerships</p>	<p><b><u>Value Proposition</u></b></p> <p>Low Prices Delivery Speed Convenient Quality Easy Shopping Varieties</p>	<p><b><u>Customer Relationships</u></b></p> <p>Online Self-service Easy payment options</p> <p><b><u>Channels</u></b></p> <p>Amazon.com Apps</p>	<p><b><u>Key Partners</u></b></p> <p>Great Prices Great way of shopping Mass Products</p>
<p><b><u>Cost Structure</u></b></p> <p>Cost of Revenue (sale)    Labor cost Packing cost                Assets cost Shipping cost                Exchange Rate cost Inventory cost                Technology cost Administrative cost</p>		<p><b><u>Revenue Streams</u></b></p> <p>Sale Prime Subscriptions Fees Income from Interest Commissions</p>		

Fig. 7. Amazon Business Model.

By applying big data analytical techniques, Amazon has the ability to segment populations and use broader datasets for informing their SWOT and business model. The analysis of information on a global scale provides Amazon the means to identify and leverage their most competitive factors for differentiation from their competitors. Following this technique, current and potential competitors are identified through six segments:

1. Physical retailers, publishers, vendors, distributors, manufacturers, and producers of Amazon products.
2. Online e-commerce and mobile e-commerce websites, including those that sell or distribute digital content.
3. Media companies, comparison shopping websites, web portals, and web search engines, either directly or in alliance with other retailers.
4. Companies that provide e-commerce services, including customer service, payment processing, fulfillment, and website development.
5. Companies that provide data storage or computing products or services, including infrastructure and other web services.

6. Companies that design, manufacture, market, or sell consumer electronics, telecommunication, and electronic devices.

An assessment of how competitors use their resources in creating sales, awareness and traffic is significant to quickly identify opportunities and threats that can affect market position. By using real-time analytics, data may be captured as it is generated through data streams, providing the most up to date and accurate information about the current and potential competitors and customers. Competitor pricing may be analyzed in relation to Amazon's and other competitors. Big data processing and analytics that provide risk modeling and threat analytics are useful in assessing large markets. Data mining, global market predictions across products, analytics for social behavior and customer trends are all viable methods in assessing the operational environment and capabilities of a business.

Several potential threats are recognized with respect to current and potential competitors. This includes those that have more resources, longer histories, a larger customer base, and stronger brand recognition than Amazon. These competitors may impact Amazon's business through securing better terms from their suppliers, implementing more aggressive pricing structures, and applying more resources towards technology, infrastructure, marketing, and fulfillment. There is also the potential for other companies to form partnerships in order to strengthen their competitiveness. On the other hand, a competitor's profit margin is an area of significant opportunity due to ability to undercut competitors in the online retail industry.

Amazon is well known for its acute customer insight and has been leveraging customer data for years in order to strengthen their market leadership position. The use of customer facing technologies provides a wealth of data used to improve performance, increase sales, and create value for customers. Identifying patterns in customer data and purchasing habits allows Amazon to personalize the products and services they offer and machine learning allows Amazon to make product and service recommendations based on the customer's habits and preferences. Further, customer behavior may be analyzed to identify needs that are not being fulfilled. The company aggressively invests in infrastructure and technologies to support rapid expansion and leveraging of their customer base.

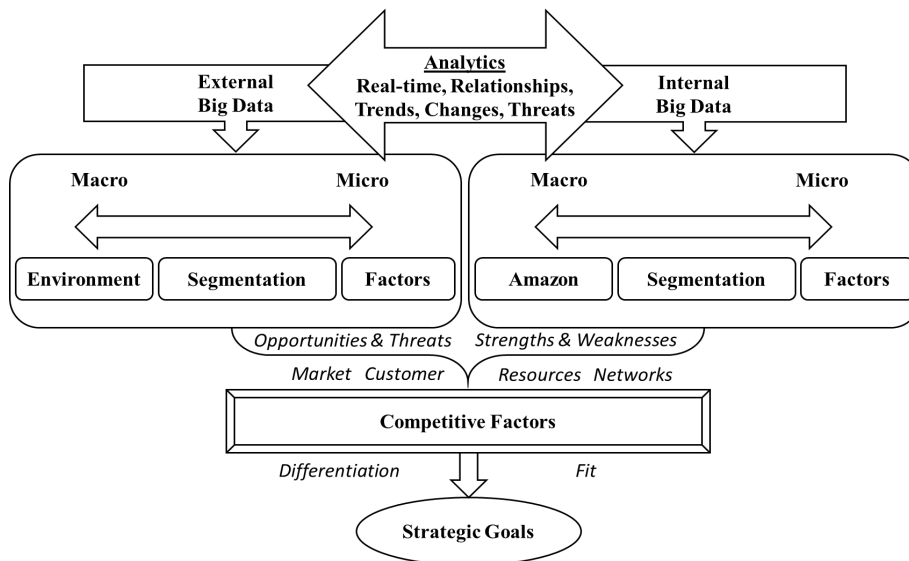
Any changes that may affect Amazon's business may be assessed through existing data and data streams on an enormous scope and scale. The following two primary competitive factors are identified:

1. Online retail: selection, price, and convenience, including fast and reliable fulfillment.
2. Seller and enterprise services: the quality, speed, and reliability of Amazon's tools and services.

Amazon focuses on creating customer value in order to strengthen their market position and economic model and continues to leverage customer data to achieve this goal. The company has developed and implemented technologies and services that not only benefit customers but also supply them with a wealth of customer data to inform their strategies and operations. Improving the shopping experience of the customer is an ongoing practice. The introduction of 1-Click shopping created convenient purchasing, while customer reviews and pricing comparisons empowered customers with

transparency and control over their investments. The company's low prices, vast offerings, recommendation features, and fulfillment performance has paved the way for building customer relationships and brand strength. Further, Amazon has created customer and product data transparency internally to create customer value through superior customer service. For example, the customer that submits an online customer service request receives a phone call from a customer service representative within 30 seconds of clicking the submit button. In addition, the representative is provided with all of the relevant customer and product information needed to address the customer's issue prior to engaging the customer in conversation. Customers are often frustrated by having to provide customer service representatives with information that they know the company already has such as name address, and phone number and generally expect a customer service call to be a negative experience. However, Amazon's customer service representatives are typically able to resolve customer service issues within a matter of minutes. Amazon's management and use of customer big data has gained the trust and loyalty of many consumers and opportunities exist to better tailor the customer experience.

Figure 8 depicts the application of big data analytics to Amazon's SWOT analysis and business model with the result of well-informed strategic goals.



**Fig. 8.** SWOT and Business Model Applying Big Data Analytics.

How Amazon chooses to compete, the products and services they choose to offer, their basis for differentiation, along with their competitive advantages can be derived from well managed data and the ability to extract insights from that data.

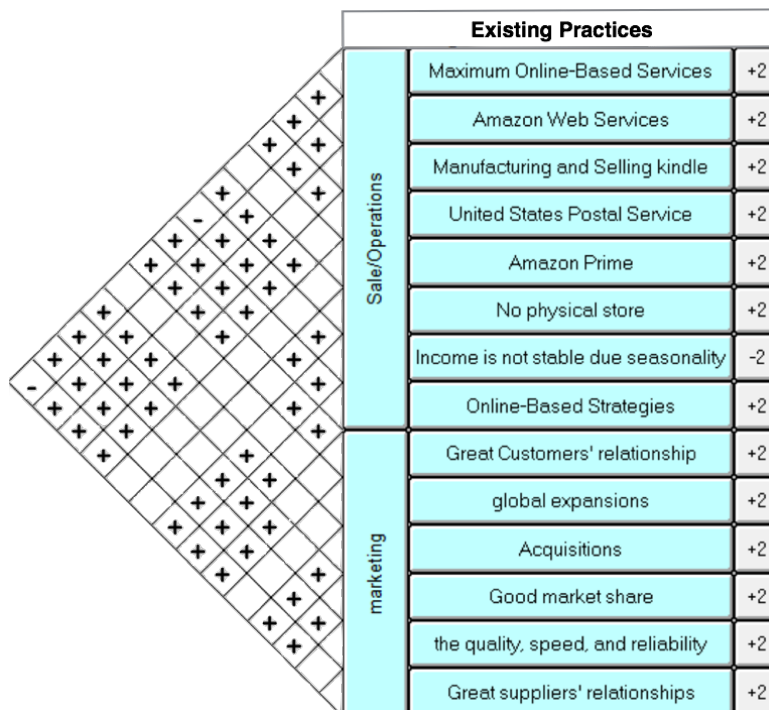
### 2.2.3 Amazon Matrix of Change (MOC)

The SWOT analysis of Amazon will be used to build Amazon's MOC. Using the MOC will allow us to visualize the case at hand. The MOC analysis is mainly focused on detecting the current and the future practices. Then both practices will be compared to each other to inspect the interactions among them in order to start stakeholder



dialogues. Generally there will be two situations: If the transition matrix has more reinforcing than interfering interactions, that would mean the transition will not be so easy and smooth and vice versa. The insights derived from the MOC can be useful in determining the type of leader needed to implement changes along with strategies for achieving successful change.

Figure 9 depicts Amazon’s current practices for the development of the MOC, which are organized by marketing and sales and operations categories. Each practice is evaluated and scored (-2 to +2) with respect to its level of importance. A score of +1 or +2 reflects the degree to which the practices should be preserved during and after the transition. A 0 indicates no preference, while scores of -1 or -2 reflect problematic practices. Practices are compared to one another to evaluate whether or not they complement each other. Complementary practices are shown by a “+” sign, while interfering practice are shown by a “-“ sign.



**Fig. 9.** Amazon Matrix of Change Current Practices.

Amazon’s current practices are identified in order to provide a snapshot of the current marketing, sales, and operations capabilities. It is important to capture the situation at hand in order to assess how current strengths and weaknesses impact potential change initiatives.

Figure 10 depicts Amazon’s future target practices for the development of the MOC, which are organized by operations, human resources, and marketing strategy

categories. Consistent with the current practices assessment, the target practices are evaluated and scored with respect to importance and each target practice is compared with one another to identify complements and interferences.

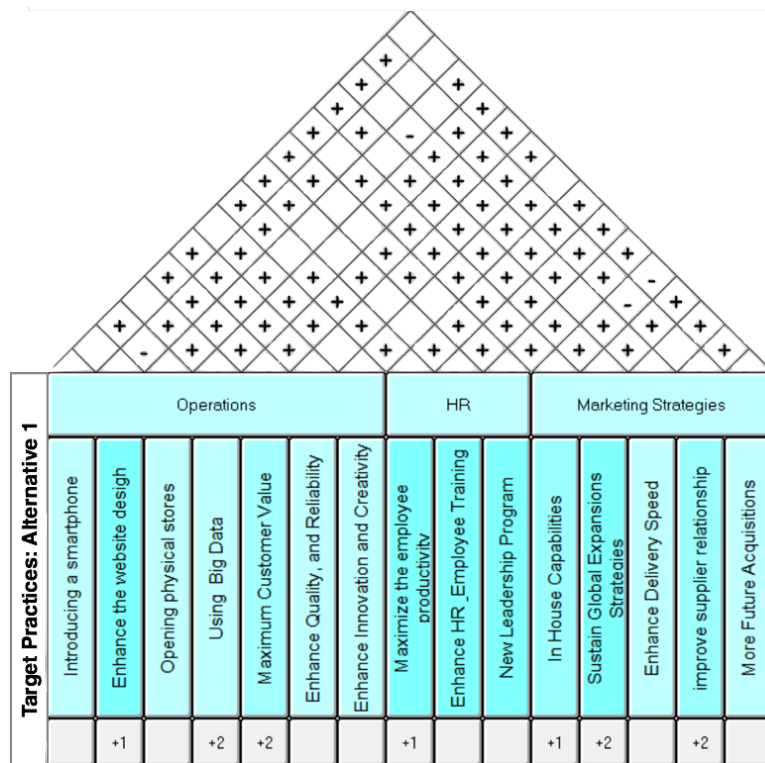


Fig. 10. Amazon Matrix of Change Target Practices.

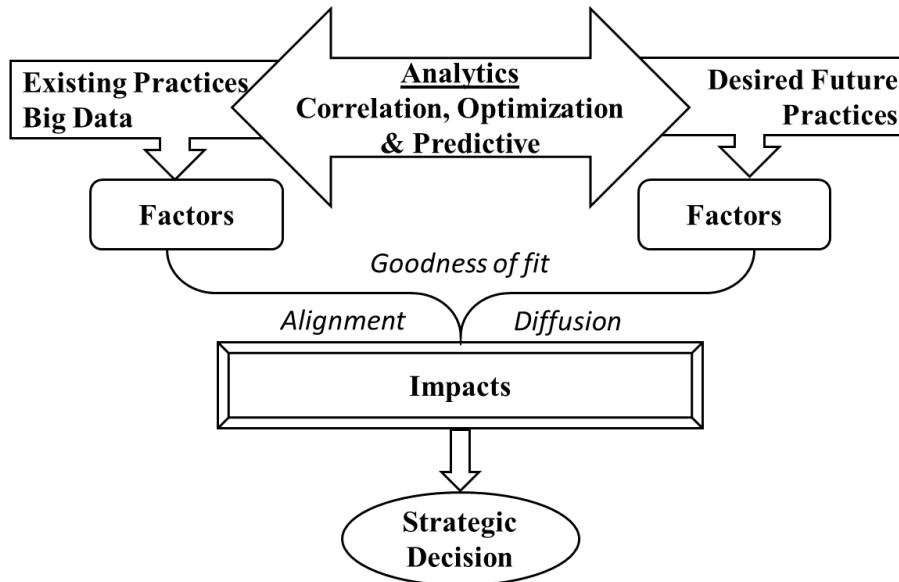
The future target practices for operations and human resources, along with future marketing strategies represent how Amazon may take advantage of opportunities and mitigate potential threats. From here, we may assess how Amazon’s current state affects the desired future state.

The completed MOC for Amazon is shown in Figure 11. Each current practice is compared to every target practice to determine whether or not their interactions will strengthen or interfere with achieving the desired future state, and is indicated by a “+” or a “-” sign within the transition matrix. The completed MOC shows that the positive interactions between the target practices and the current practices are more positive than negative interactions in the transition matrix. This means that the transition will not be so easy and smooth in all leadership styles.

The insights derived from Amazon’s MOC give stakeholders and management an idea about the relationship between the current business practices and the proposed future strategies. It is a great insight for better understanding the transition process and they type of undertaking needed to achieve a successful transition.



not. The philosophy is that valuable knowledge will be acquired from either result. Further Amazon believes that scale is critical in realizing the potential of their business model and thus focuses on growth and expansion.



**Fig. 12.** Matrix of Change Applying Big Data Analytics.

By taking advantage of the wealth of data that Amazon currently houses, analytics may be applied to identify correlations and to generate optimization and prediction information for assessing transition into potential future states. Decision makers stand to gain from this approach as it better informs their strategic decisions through use of accurate and quality data. Further, the breadth of information used in the analysis may provide insights that would not have necessarily been apparent had a limited set of information been employed.

#### 2.2.4 Amazon Strategy Map & Balanced Scorecard

Strategy is about focus and choice, and a strategy map is the cornerstone of strategy formulation. Its function is to outline Amazon's primary strategic objective. To account for the entire set of competitive factors, multiple perspectives are reflected: financial, customer, internal processes and learning and growth. Putting all the perspectives together result in the Strategy Map shown in Figure 13.

The financial perspective concentrates on creating long-term value for shareholders. In Amazon's situation, this should be achieved with Amazon-branded smartphone sales, up-selling retail customers, reducing customer acquisition costs with improved targeting of advertisements, promoting services with higher profit margins, and increasing overall conversion rates; each of these would directly impact the bottom line. In ecommerce, the conversion rate is a crucial KPI (Key Performance Indicator) that represents the ratio of customers browsing products to completed transactions. Enhanced customer experience and customer loyalty has a direct causation correlation with financial objectives, since satisfied customers are more likely to purchase new

products, be susceptible to cross-selling recommendations, visit Amazon directly instead of through paid channels, and share their shopping experience with potential customers. These are all key drivers of ecommerce conversion rates.

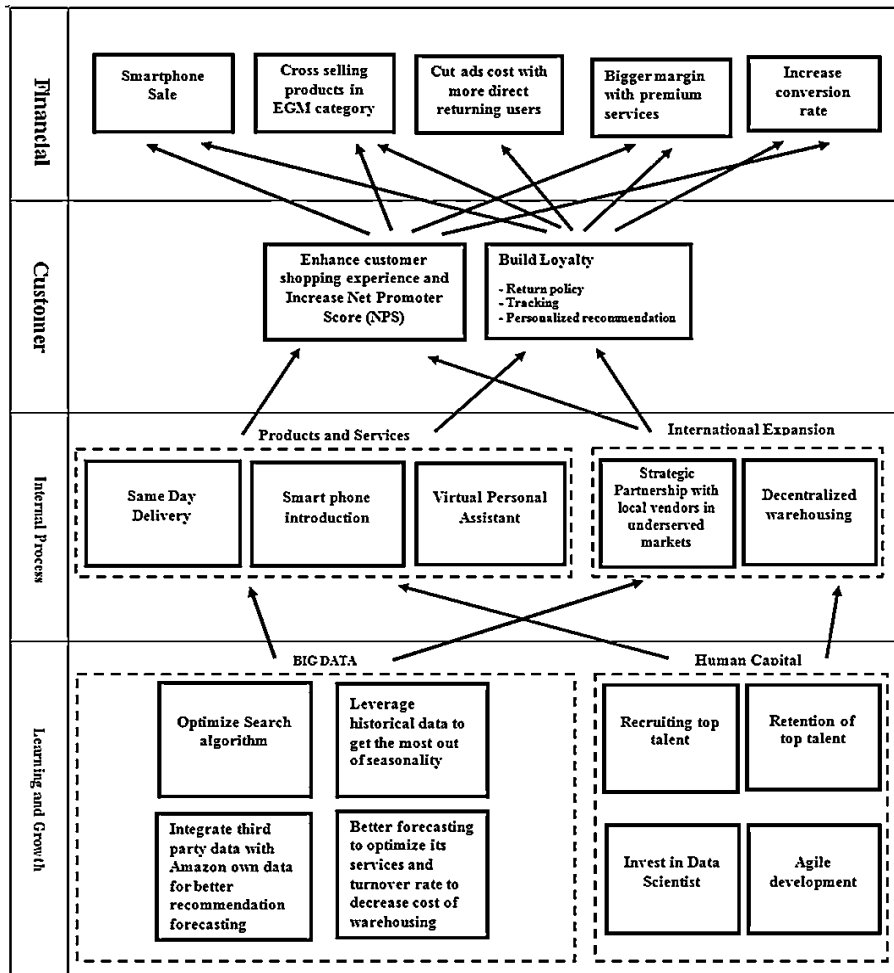


Fig. 13. Amazon Strategy Map.

The customer perspective is linked to the aforementioned financial objectives. It articulates the objectives most relevant to the customer. Material enhancements in the shopping experience are an essential element of the sales process, since they impact customer perception of the brand and, consequently, the future propensity to promote or disparage the brand.

Building loyalty and enhancing the customer experience is the result of Amazon's product offerings, such as a smartphone that would create a captive audience for Amazon's logo and bundled apps/services, superior delivery service like same-day delivery that would create a credible alternative to purchasing products typically sourced in local stores, and a virtual assistant that could answer questions, perform

purchases, and arrange delivery through voice commands on mobile devices. An international presence with decentralized warehousing has the potential to grow market share through accessible supply and quick delivery.

The internal processes, grouped as product and services objectives and international expansion objectives, are supported by investment in human capital where Amazon should focus on:

1. Recruiting top talent to create an elite team that supports the internal process objectives such as the launch of new products and services which will require R&D and experienced talent in the field of development of the new products.
2. The retention of the talent will be an essential part for the human capital objective as it would increase the focus on the objective and avoid distraction and knowledge loss from employee turnover
3. Data scientists will be the back bone of the agile teams able to data driven decisions with a higher likelihood of success in supporting the business objectives.
4. While agile development will be the environment/framework where those teams should operate to be able to quickly deploy, learn and reiterate on the products to achieve customer satisfaction and ultimately have the desired financial impact on the business.

Coupled with a strategy map is a balanced score card which provides the measures and targets that support the objectives identified in the strategy map. The balanced score card for Amazon is shown in Table 3.

**Table 3.** Amazon Balanced Scorecard

Perspective	Objectives	Measures	Targets (2015)
<b>Financial</b>	Smartphone Sales	Number of Smartphones Sold	1.5% of Global Smartphone shipment
	Cross-Selling Products in the EGM category	Number of cross-sold items after each acquisition in EGM	Depends on Amazon historical data of how many people browse "related" products to their initial purchase
	Cut ad costs with more direct returning users	Percent of users returning through direct/free channel after first acquisition	This number will be proportioned with the growth of premium service users
	Bigger Margin on Premium Services	Increase the profit margin and maintain premium services growth	At least 3.2% margin
	Increase conversion rate	Conversion rate on Amazon Market Place	Reach 8% conversion rate to match its peak season
<b>Customer</b>	Enhance customer shopping experience and Increase net Promoter Score (NPS)	Average sessions to buy NPS score	Maintain the lead in the online shopping segment and increase the gap between rivals
	Build Loyalty	Number of returning users with a purchase	No public data
<b>Internal Process</b>	Same Day Delivery	Number of purchases in new product segments where Amazon under-index compared to physical stores	Service the biggest city in every state by the end of 2015 with Amazon fresh
	Develop a Smartphone line	Time to market with first product	Launch by 2015
	Virtual Assistant	Customer engagement with	Launch by 2015

Perspective	Objectives	Measures	Targets (2015)
	Strategic partnership with vendors in underserved markets	the new tool % of revenue increase in currently underserved ma	As needed
	Decentralized warehousing	Number of users served per warehouse in the new markets	Based on pilot result
<b>Learning &amp; Growth</b>	Optimize Search Algorithm	Number of product purchased from 1st page search result	No public data
	Better forecasting to optimize turnover rate	Higher turnover rate	This will depend on product segment
	Leverage historical data for better seasonality prediction	More peak periods per UFI and UFI to UFI (unique feature identifier)	Replicate multiple peak seasons across 2015
	Integrate third party data for better recommendation	Sold items related to events predicted by using the new data set integration	Integrate data of at least one partner in every under-index area of products sale
	Human Capital	Increase of productivity Number of successful new features introduced in A/B testing environment	Target one code rollout a day Increase the number of running experiments per page At least 2 years employee turnover Hire one data scientist for each section of the conversion funnel

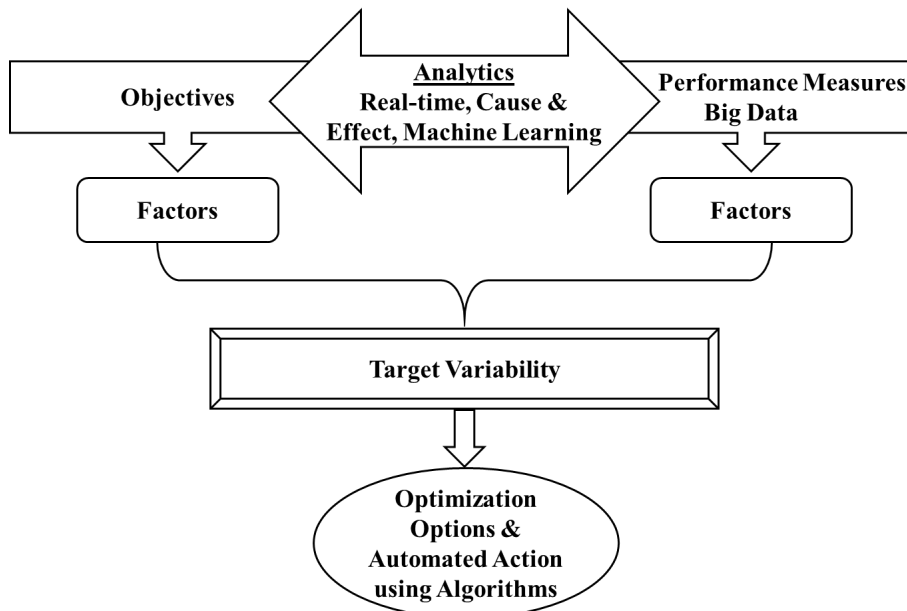
The customer shopping experience objective, associated with the customer perspective, is measured by the company NPS (Net Promoter Score) and is described in Table 4.

**Table 4.** Net Promotor Score Categorization

Category	Description	Score
Promoters	Loyal customers who are brand enthusiasts and will continue to buy and refer others, which positively affects organic growth	9-10
Passives	Users considered as vulnerable to competitive pressures of other companies, especially in an industry with low switching costs.	7-8
Detractors	Customers who may be categorized as unsatisfied customers who may actively damage the brand and slow growth though negative word-of-mouth and social media.	0-6

The NPS is the percentage of customers who wouldn't recommend the company subtracted from the percentage of customers who would promote the company. This methodology is used by leaders as a substitute for the customer satisfaction survey. The interpretation of the net promoter score also depends on the sales stage at which it is placed. For instance, an NPS question asked at the end of the transaction on an ecommerce site better indicates satisfaction with platform rather than customer satisfaction with the product purchase subsequently captured by the product reviews.

Figure 14 depicts the application of big data analytics to Amazon's strategy map and balanced score card. Amazon's measures are consistent with their strategic objectives that support market leadership.



**Fig. 14.** Strategy Map and Balanced Scorecard Applying Big Data Analytics.

Customer growth, revenue gains, brand strength and the degree to which products and services purchases continue and are repeated by customers are key measures for Amazon’s market leadership. Strategically, Amazon seeks to generate revenue through the use of their devices rather than the purchase of devices for better alignment with their customers. Typical industry programs that rely on customers to upgrade products are not building relationships, learning from their customers, and improving the customer’s experience in the way that Amazon seeks to accomplish. In fact, real-time analytics, regression modeling, pattern recognition, and machine learning capabilities allow Amazon to institute automated systems that actively seek instances where a customer’s experience hasn’t met Amazon’s standard. In such instances, decision criteria is built into algorithms that will automatically provide customer refunds. This practice is extended into their pre-purchase programs that automatically refund customers the difference between Amazon’s guaranteed lowest price and the release price of a product. Again, this is another way that Amazon builds relationships, trust, and loyalty among their customers which is an important factor in increasing their customer base.

Machine learning is at the core of many of Amazon’s capabilities to serve their customers efficiently and effectively. Statistical properties of datasets are used to train models in finding patterns within the data through machine learning algorithms. These algorithms are able to quickly optimize models and can easily generate real-time predictions. In 2014 Amazon released the Amazon Echo, which incorporates machine learning based on voice recognition. The device is connected to Amazon’s cloud and supported by their web services to provide users with voice controlled access to information, music and more, while continuously learning about its owner and adding more functionality over time based on speech patterns and user preferences.



Big data will be central in guiding new deployments and objectives while acting as a foundation for business decisions in achieving those objectives. By optimizing the search algorithm, Amazon will have the foundation for a good visual assistant as it would mean it was able to answer the customer's "typed" query in an efficient manner which will be the step before converting from the typed query to the "talked" query. Furthermore by leveraging historical data, optimization of the turnover rate would assist with increasing warehousing efficiencies for products with higher turnover rate and ROI. Amazon can also use this information to add efficiency to partners, especially during international expansion which would result in bigger margins for Amazon. By using third party data more accurate forecasting can be achieved in determining which products will be needed in a specific period in a specific area. Such data may include information related to electricity outages, natural disasters, or even medical data from pharmaceutical companies that inform which products sell more, to who and which period.

### **3 Results**

Our research indicates that companies stand to gain from making use of the wealth of data they themselves collect internally and from their customers. Streamlining and optimizing internal and customer interface processes have strong potential for enhancing customer satisfaction, increasing sales, and gaining cost efficiencies. Market insights through customer segmentation, consumer trends, and economic growth can inform a company's strategy development, product and service planning, and resource allocations. Competitors with innovative strategies in cross-cutting industries may be assessed more accurately to identify opportunities that may exist. While machine learning offers enhanced consumer optimization and prediction, a more transparent approach can largely benefit companies such that historical and real-time information may be accessed in a meaningful way by employees to improve the efficiency and effectiveness of their work. Internal transparency can enable companies to gain operational and supply chain efficiencies, allow knowledge base capabilities to significantly grow, and can also better inform decision makers by making more accurate and encompassing information available. Advanced forecasting can make the difference between proactive and reactive operations. Further, well developed forecasting capabilities can enable companies to identify trigger points, align infrastructure and capabilities, and appropriately deploy expansion of products and services. Some companies may even be capable of triggering events that allow growth in certain market sectors.

From the customer perspective, customer and market data can allow companies uniquely meet customer needs and enhance customer satisfaction. Customers are aware that companies have their information, however often times companies are not transparent regarding what they use customer data for and do not show they use the customer's information in a useful way. Customer interfaces, especially customer service, should be a key focus for companies yet are still lacking in many areas of industry. It is frustrating and inconvenient for customers to provide information that they know companies already have. Customer service representatives are all too often not provided with the information they need to effectively deliver customer service.

However, data warehousing and acquisition techniques, along with internal transparency, can provide customer service representatives with the customer information and prescribed solutions needed to effectively and efficiently resolve customer issues.

Given the current technology advances, more and more companies may take advantage of data storage and analytical capabilities offered through third party providers. Also, companies that implement big data analytics may have data that other companies find valuable. If such data is not essential in maintaining a competitive advantage, these companies stand to gain additional profits by partnering with outside companies and allowing access to their data. External data sources that implement big data analytics can allow companies to identify more opportunities and threats than would not otherwise be realized. Additionally, trends in social networks or purchasing behavior can provide much more advanced predictive capabilities for companies that tap into data rich environments.

#### 4 Conclusions

In this paper, an innovative approach has been presented to help managers, stakeholders and advisors to use the big data along with the well-known management tools for the purpose of both enhancing revenue and reducing costs. Our research has several implications and opportunities for future research.

**Practical Implications.** This study proposed a framework to show and guide organizations how to boost their revenue by helping them understand their businesses through logical steps. The steps of the framework must be accomplished in an order and the big data methodology must be achieved with each steps. The application of big data is used to enhance the result of each phase in this framework. The usage of big data is virtually unlimited; innovation will differentiate between great usage of big data and poor usage of it. As our research shows, a great application of our framework is the use of machine learning to quickly build adaptive models for predictive applications, which may be executed using real-time data streams and scaled to a global level. This is only one example of how companies could leverage big data for not only enhancing decision making tools, but also boosting revenue in a competitive world. As technology and experience with big data applications advance, barriers to implementing big data analytics into business practices is decreasing. Providers of big data services are working toward infrastructures, platforms, and applications that make the capture, management, processing, and analysis of big data possible for businesses without requiring extensive expert knowledge behind such capabilities.

**Research Implications.** The research shows the emergence of big data analytics in companies worldwide. Integrated frameworks and steps that incorporate big data capabilities such as data acquisition and organization techniques, machine learning, advanced algorithms, and others in support of dynamic and competitive business environments are scant in the academic literature. Incorporating big data into strategic and operational management principles is essential in preparing our future workforce for the work environments they will likely encounter. While traditional management tools provide a great foundation for learning concepts and applying them to business

cases, future research is needed to explore ways to incorporate big data analytical methods that support these tools.

We recommend that future research take on an integrated approach from both academic and practical viewpoints. Because today's markets and technologies are rapidly changing and are converging, a solid foundation is needed in this area of research that can accommodate future change while providing practical applications. Without a solid foundation, this line of research runs the risk of generating models for any and every situation and capability with little synergy or practical meaning. We have provided some first steps to such a synergistic approach by providing a framework that couples traditional management tools with big data analytics. Additional research is needed to investigate the types of big data capabilities that can be implemented in achieving business objectives and activities while also considering the level of effort required, along with benefits compared to costs associated with implementation. Future research opportunities exist to explore big data analytical capabilities that can be implemented by companies that do not possess advanced analytical expertise compared to capabilities that require such expertise. Identifying the existing or emerging capabilities that can more easily be implemented and that also create value, can help any company to realize additional benefits. In addition, more research is needed to develop methodologies for aligning company specific objectives with specific big data capabilities for enhancing the ability to achieve these objectives.

**Limitations.** While we have focused on the potential benefits of big data analytics, there also exists a potential to cause great harm. Three important issues arise concerning big data collection, storage and analysis: privacy, security, and quality of the data. The persons whose data is obtained may perceive such actions to be an invasion of privacy. Further collecting such data may be considered unlawful in some regions and not in others. Data obtained through the internet further complicates this issue. Boundaries are not clear regarding appropriate types of information that should be collected, the means for collecting it, and what the information should or should not be used for. Protecting personal information is another concern associated with big data. Interconnected systems and increased sharing or access to large volumes of personal information can pose vulnerabilities that can result in unauthorized access and distribution of such data. Identity theft and unauthorized transactions are more common today than ever before and companies need to be prepared to protect the data they house along with contingency plans in the event of a security breach. Again, policies for protecting personal information may differ from region to region, further adding to the threat of exposure. And finally, the quality of the data being analyzed is crucial as it can make the difference between advantageous and detrimental strategic decisions and operations. Internal data needs to be integrated in a way such that it is meaningful and appropriate. Too much data can be confusing and too little may not appropriately inform the user. It is important to align company objectives, measures, and targets with architectures that implement big data analytics. This issue becomes even more of concern when obtaining third party data and methods for ensuring the quality of data are underdeveloped.

We recommend that both researchers and practitioners focus on the development of appropriate regulations, policies, and practices to address privacy, security, and quality of data issues associated with the collection, storage, and use of big data. Of course

these are complicated issues to address since regulations and policies vary from region to region, and practices are likely to be adapted to specific needs. However these issues pose ethical issues and serious threats to both customers and companies alike. As companies progress toward the creation of digital ecosystems, more effort is needed to identify practical and responsible applications in the emerging world of big data analytics.

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