Big data analytics

in

Retail & E-Commerce

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Project Presentation

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1. Abstract:

Connected devices, sensors, and mobile apps make the retail sector a relevant testbed for big data tools and applications. Here, we explore how big data is, and can be used in retail operations. Nowadays, retailers are having access to a raw material of production: Big data.

The ability to access, analyze, and manage vast volumes of data while rapidly evolving the Information Architecture is increasingly critical to retailers looking to improve business efficiency and performance. While operational efficiency, favorable customer experience, and loyalty and retention of customers remain keys to success, anticipating demand is important for more efficient inventory management, cash management and overall profitability. As retailers become larger and more diverse, the type of data that is managed becomes more complex. Analysis of this data can lead to better understanding of what products drive the highest profitability per square foot.

2. Introduction to Big Data:

Big data is any voluminous amount of structured, semi- structured and unstructured data that has the potential to be mined for information.

It is a large/complex data set(s) that traditional data processing applications cannot deal with.

2.1 Importance of Big data:

The importance of big data doesn't revolve around how much data exists, but what interpretation is done to it, so that a meaning is pulled off. Data can be taken from a source and analyzed, to find answers that enable,

- cost reductions
- time reductions
- new product development and optimized offerings
- smart decision making

When the data is combined with high-powered analytics, business-related tasks can be accomplished such as:

- Determining root causes of failures, issues and defects in near-real time.
- Generating coupons at the point of sale based on the customer's buying habits.
- Recalculating entire risk portfolios in minutes.
- Detecting fraudulent behavior before it affects your organization.

3. Big data Analytics:

The concept of big data has been around for years; most organizations now understand that if they capture all the data that streams into their businesses, they can apply analytics and get significant value from it.

The new benefits that big data analytics brings to the table, however, are speed and efficiency. And, today business can identify insights for immediate decisions. The ability to work faster and stay agile, this gives organizations a competitive edge they didn't have before.

Big data analysis is the process of inspecting, cleaning, transforming, and modeling the data with the goal of discovering useful information, suggesting conclusions, and supporting decision making.

3.1 Importance of Big data analytics:

Big data analytics helps organizations harness their data and use it to identify new opportunities. That, in turn, leads to smarter business moves, more efficient operations, higher profits and happier customers. Usage of big data in business can bring value in the following ways:

1. **Cost reduction:** Big data technologies such as Hadoop and cloud-based analytics bring significant cost advantages when it comes to storing large amounts of data – plus they can identify more efficient ways of doing business.
2. **Faster, better decision making:** With the speed of Hadoop and in-memory analytics, combined with the ability to analyze new sources of data, businesses can analyze information immediately – and make decisions based on what they've learned.
3. **New products and services:** With the ability to gauge customer needs and satisfaction through analytics comes the power to give customers what they want. Davenport points out that with big data analytics, more companies are creating new products to meet customers' needs.

4. Big Data - Algorithms and Tools:

Such huge data is meaningless unless someone pulls an interpretation from it or draws some narrative to it. Some algorithms and tools are designed specifically to handle big data operations.

A recent survey says that 80% of the data created in the world are unstructured. One challenge is how these unstructured data can be structured, before we attempt to understand and capture the most important data. Another challenge is how we can store it. These algorithms and tools are used to store and analyze big data in an efficient and cost-effective way.

4.1 Algorithms:

Businesses are increasingly relying on the analysis of their data to predict consumer response and recommend products to their customers. However, to analyze such massive amounts of data, the solution clearly must be compute-driven. In data science, several algorithms built on statistical models are available for data scientists to create analytic platforms. Which algorithm is chosen is based on the goals that have been established beforehand, just as a statistician chooses the appropriate statistical model based on the problem to be solved. Although there are many algorithms, these methods, Classification, Regression, and Similarity Matching are the fundamental principles on which many of the algorithms used in data science rely.

Few of the most commonly-used algorithms in retail industry are,

- K-Means Clustering Algorithm
- Association Rule Mining Algorithm
- Linear Regression Algorithms
- Logistic Regression Algorithms
- Apriori

4.2 Tools:

The market is flooded with several Big Data tools which provide real business value by bringing cost efficiency, better time management, and analyzing data to discover valuable business insights.

Few of the most commonly-used tools are,

- Hadoop
- Cloudera
- MongoDB
- Hive
- Spark

5. Big data in Retail industry:

Before big data came into roll, retailers followed 'Data-driven approach' to analyze data. This is a methodology where huge amount of historical data is collected and looking at past data and general averages across wide swaths of customers, estimations of future inventory needs were made. This used sales data from previous years to estimate next year's inventory, future sales forecasts, average cart size and items most often purchased together to target offers, etc.

This came with both advantages and disadvantages. The latter being,
- Heavy investment on surveys which were time consuming
- Revealed only macro-level predictions based on averages or generalities
- Not-so-accurate predictions

Introducing big data methodologies to retail data, it enabled retailers to do micro-level predictions - that is down to a specific individual. Retailers can now look at each individual and evaluate their purchases in real time to accurately predict their next purchase (what they would buy based on their specific buying habits).

The growth of big data analytics (or BDA) is the new frontier of innovation and competition in the giant spectrum of the e-commerce landscape.

As of January 2018, over twenty traditional retail chains, including Sears and Radio Shack, were either liquidated or have filed for bankruptcy. (Fact) These failures are due in large part to these retailers' slow adaptation to the digital retail marketplace. In contrast, today's most successful retailers have seamlessly integrated digital storefronts with brick and mortar stores and are leveraging huge volumes of data gathered on suppliers, competitors, store locations, social media, customer purchasing and lifestyle behaviors to create value. These retailers are embracing retail analytics powered by big data to develop and execute strategies for improving profits.

Big data has changed the retail landscape. Old retail models cannot survive without making changes and adopting new retail analytics tools that provide a holistic view of every customer across every channel and help to generate profit-maximizing insights. Once a retailer possesses a deep understanding of what its customers are buying and why, there are numerous benefits to reap in the areas of marketing, merchandising, sales, operations and supply chain management. Big data is the most eligible option to switch which helps retailers in understanding the customer analytics and behavior and in turn achieve huge benefits.

6. Impact of Big data in Retail:

Big data is helping retailers to understand their prospects on a deeper level and with a host of metrics including social media preferences, browsing behaviors, devices preferences, geographical demographics and much more readily available, brands are branching out in more meaningful ways than ever before.

Big data offers in-depth information about the people your brand is targeting and it's changing the face of the retail world in a colossal way.

6.1 Advantages of using big data

Besides the fact that big data analytics is helping those in the retail sector understand their customers far better, making the experience more personal, engaging and initiative at every stage of the buying journey, it also has notable benefits in other areas:

- Demand: By understanding data-based insights on customer habits, retailers can understand which of their products and services are most in-demand and which ones they should potentially stop offering. Not only can these insights serve to save money and where to place investment, but it will also help brands to give the consumer exactly what they want.
- Prediction: Trend forecasting algorithms in big data can help brands make key market predictions and forecast consumer trends. Thanks to professional data alerts, retailers monitor the demand fluctuation in real-time, and can develop products that will provide them with the best return on investment.
- Pricing: By gaining access to insights on real-time customer transactions, retailers can gain a better understanding which prices yield the best results on some products. Big data technology can also be utilized for 'markdown optimization' – an understanding of when prices on some items should be dropped. Retail giant Walmart has reaped the rewards of real-time merchandising, and as a result of its success, the brand is now in the process of building the world's biggest private cloud in a big to dig even deeper into the behavior of its customers.
- Cross-channel: In today's world, the omni-channel experience is a big deal. Google research suggests that 98% of Americans switch between devices in the same day. As mobile technology and social media become more sophisticated, consumer craves a retail experience that offers value across a host of mediums and devices. Retail big data gives brands the power to harness insights extracted from these various devices and mediums to create campaigns, initiatives and offers that create a buying journey that works seamlessly both in a digital and physical sense. And as retailers that adopt omni-channel strategies earn 91% greater year-over-year customer retention rates compared to companies that don't, this is an area that you can't afford to ignore.

7. The Big data shift:

With the huge success of big data analytics in retail, major retailer brands are shifted their focus on 'Big Data' as a means of generating big revenue and adopted big data analytics to improve their customer shopping experience.

Target

Targets pregnant women even before they share the baby news.

Target analyzed historical buying data of all the ladies who signed up for Target baby registries in the past. This study resulted in a noticeable data pattern.
Target identified that women buying large quantities of unscented lotion, cotton balls, supplements and washcloths might mean that she's anywhere from a few weeks pregnant, to very close to her due date. Target used this to promote baby products and mail discount coupons to such customers.

Costco

Costco solidifies customer loyalty with fast warnings circulation.

Costco is known to be collecting reams and reams of user data even before big data. But, with big data Costco was able better streamline the user data.
A California fruit packing company warned Costco about the possibility of listeria contamination in its stone fruits. Instead of a blanket warning to everyone, Costco notified the specific customers that purchased some of those fruits in a given period.

Costco was able to help CDC pinpoint the source of salmonella outbreak back in 2010.

The Weather Channel

The Weather Channel takes advertising by storm.

The predictive weather analytics looked at trends based on location, and guide advertisers on how and when to deliver their message to help spur action.

One such example was the partnership between Pantene, Walgreens and the Weather Channel. Using data collected by the Weather Channel, Pantene and Walgreens were able to anticipate when humidity in the air would be at its highest, prompting women to seek out a product at their local drugstore to prevent frizzy hair. This was branded as a #haircast and lead to a 10% increase in sales of Pantene at Walgreens for the months of July and August, along with a 4% sales lift across the entire hair care category at Walgreens.

Amazon's recommendation secret

According to a source, 35% of Amazon's revenue is now generated by its recommendation engine.

Amazon analyzes, what a user has bought in the past, which items they have in their virtual shopping cart, items they've rated and liked, and what other customers have viewed and purchased.
Amazon calls this "item-to-item collaborative filtering" and uses this algorithm to customize the browsing experience.
- Recommended for you
- Frequently bought together
- You recently viewed these items and featured recommendations
- Related to items to viewed
- Customers who bought this also bought

The company reported a 29% sales increase to $12.83 billion during its second fiscal quarter, up from $9.9 billion during the same time last year.

Starbucks

Retail winner having uncanny ability to open several branches on the same block.

By using big data analytics to its advantage, Starbucks can predict the growth potential of each new store by analyzing the metrics such as location, traffic, area demographics and customer behavior.
Moreover, Starbucks gathered insights from their 90-plus million transactions per week and used this data to deliver a personalized experience to its customers,
- Collecting data about customer orders
- Personalizing ads and vouchers
- Recovering lost customers

8. The future of big data in retail industry:

Big data being collaborated with other recently emerged technologies can bring in more benefits to retailers.

Big data and IoT:

Retail stores will be enabled with sensors that detect a nearby shopper with the app on their phone or tablet.
The app will deliver timely incentives and offers to help
- Turn over more products
- Introduce shoppers to new products that they were not aware of

Big data and Social Media:

Big data will swoop into social media websites like Facebook, Twitter and Instagram. With better data analytics, retailers can filter out the useless noise and zero in on real data which applies to what they need to know about,
- Their customers
- Public perception of their brands
- How people respond to their products

Big data and Store layout:

Big Data could tell what store layout that will result to maximum gross sales. Some stores managed to significantly boost revenue via making minor adjustments to the retail stores layout. Big Data can help with,
- Product placement
- Floor plans
- Arrangements of cash registers

Big data and Supply Chain Management:

Big Data would also be useful for retailers outside the customer relationship. For instance, already I tis making a huge impact on the supply chain logistics and management. Big Data could check out what region that a new product will be most popular as well as determine the best route to have more stock delivered there. In addition, big data could help find the best supplier relationships and even useful for the management of the relationship and negotiations.

9. Conclusion:

Big Data analytics is now being applied at every stage of the retail process, working out what the popular products will be by predicting trends, forecasting where the demand will be for those products, optimizing pricing for a competitive edge, identifying the customers likely to be interested in them and working out the best way to approach them, taking their money and finally working out what to sell them next.

Without doubt, big data would continue to evolve, shaping the future of retail wherein connected, intelligent and automated technologies would be the new norm in customer satisfaction.

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