

BIG DATA ANALYTICS TO PREDICT CUSTOMER BEHAVIOR FOR PERSONALIZED BANKING SERVICES

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Abstract

In response to today's dynamic business and competitive nature, many banks in India are providing online banking to increase the customer's satisfaction and maximize profit. In online banking system the bank has a centralized database that is web-enabled and provides online services who utilizes various Information and Communication channels for customer's interaction. As customer interactions in banking move from in-person to digital channels, you not only have to react faster; you must also be able to predict future behavior which is very useful to achieve better operational efficiency and create a new product market. It is possible by using high end predictive analytics and Big Data analytics is a better solution. This paper represents overview, current scenario, challenges and importance of big data and big data analytics in banking sector to forecast its future scenario. We have reviewed various articles and research papers in the relative field, covering the most interesting and the advanced topics on Big Data, Big Data mining, big data analytics and banking.

Key Words: Big Data, Big Data Mining, Volume, Velocity, Variety, Hadoop, Customer Behavior.

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Introduction

In today's competitive era banks around the world are experiencing drastic change due to adoption of new economic policies and facilities like online banking. In India many banks are providing various quality products and services to gain customer's satisfaction and maximize profit. The experience of banking has changed dramatically in recent years as acceptance of new Information and Communication technologies. Customers can easily research and compare financial products and services from any device and application. When a bank introduces a new service or product, customers can share their reviews about that particular service or product through Face Book, Twitter, boards and blogs and influence other prospective customers. So the banks can now counter to analyze customer behavior by focusing its communication strategies on particular product review sites and social media sites to quickly remediate and personalize banking services to gain customer's satisfaction to retain the existing customers and turn the visitors as new customers.

To compete in this new dynamic environment, bankers have to provide new strategies to attract and retain customers. Big data and Hadoop can enable bankers to connect with customers through multiple channels by harnessing the massive volumes of new data available today. Big data provides organizations with greater opportunities by exposing customer's hidden behavioral patterns and helps to bridge gap between what customers want to do and what they actually do. This information is useful to make business decisions and improve services to increase operational efficiency and create new product or markets. [7]

Big Data is the term for a collection of data sets so large and complex that it becomes difficult to process using on-hand database management tools or traditional data processing applications. In recent years we have seen the dramatic increase in the growth of information due to collection of data from various independent or connected applications and services. Every day we create 2.5 quintillion bytes of data. 90% of the data in the world today has been created in the last 2 years. This rapid expansion is accelerated by the dramatic increase in acceptance of social networking applications such as Face Book, Twitter and Mobile Phones etc. Every day Google has more than 1 billion queries per day. Twitter has more than 250 millions tweets per day, Face Book has more than 800 million updates per day and You tube has 4 billion views per day and so on. We

are also receiving large amount of data from numerous sources like Sensor Networks, Government Data Holdings, Company Market Lead Databases, CCTV, E-Health networks (X-Rays, CT Scans and MRIs) etc. This massive amount of data is called as Big Data [9].

Big data brings together large amount of structured, semi structured and unstructured data with various data types and huge size from social networking applications such as Face Book, Twitter and Mobile Phones etc. According to Gartner Big Data is defined in terms of Vs Volume (Quantity of data from terabytes to zetta bytes), Velocity (data comes at high speed) and variety (data available in various formats). This huge amount of data is very valuable to take proper business decisions, improve quality of life and make our world a better place by analyzing and extracting meaningful information, trend and patterns, but it is unmanageable. Here comes the role of big data collection and big analytic applications to analyze and process both structured and unstructured data in order to extract meaningful information and patterns from the large sets of information and streams [9].

Contributed Articles

Banking on Analytics: How High-Performance Analytics Tackle Big Data Challenges in Banking White Paper SAS 2012

According to Howard Rubin, “The problem with the future is that it is not the past, and as such, we have no models of its workings. To develop these models, inventions and innovations are needed. For companies/organizations, the challenge is to rapidly adapt to and embrace technology economics through the development of new financial models and governance mechanisms. If the problem with the future indeed is that it’s not what it used to be, then those who figure out what it is first will be the winners.” With continued challenges from the global economy along with dramatically increased regulatory and compliance demands, it is clear that banks must use all of their resources to survive and thrive. Big data – both internal and external – provides the natural resource. But it must be converted to fuel before it can be used. Using high performance analytics as the fuel, you can gain the insight you need to power better decisions and actions across the institution. [1]

Big Data technology use cases for banking and financial services- TCS 2013

The banking and financial services (BFS) industry has been one of the biggest adopters of Big Data technologies such as Hadoop. It would be a gross understatement to say that the Big Data world in general and the Hadoop world in particular are going through a major churn. This is both in the form of existing platforms becoming richer in features and functionality and new players entering the fray. With rapid adoption rates, the scramble to migrate to affordable Big Data platforms like Hadoop is being experienced by all verticals, especially in the BFS space. One of the key drivers is the sheer velocity, variety and volume of data that is generated and needs to be processed.[2]

Big Data Solutions for Finance [Open Source Integration]

Large financial institutions may generate trillions of events per month, resulting in terabytes of reports. Hadoop is being used by these institutions to analyze this massive amount of data for completeness and quality. A Hadoop-based system can be implemented for a much smaller outlay than upgrading a legacy MPP system, and can scale horizontally over time as the datasets grow, with minimal difficulty and cost. [3]

More Personalized Banking Through Big Data and Analytics BY Tom Groenfeldt-2013

The future is bright for banks that learn to use big data and analytics to gain a competitive edge. However, dealing with all that data is not always easy and progress can take time, says David Tanis, manager of information systems and frontline analytics at CBA. At the Gartner Business Intelligence & Information Management Summit 2013 in Sydney in February, Tanis said every analytics project is a learning experience, especially when it involves big data.[4]

Capitalizing on the promise of Big Data [www.pwc.com/us/bigdata Oliver Halter principal, Anand Rao,Principal]-2013

Big Data is changing the fundamentals of how information is managed and analyzed. Just ten years ago, the largest datasets were in the hundreds of terabytes, but in today's Big Data environment, it is not unusual for Fortune 100 companies to deal with datasets in the dozens or even hundreds of petabytes. Limitations in analytical tools made timely and meaningful analysis of large datasets difficult. Financial firms are harnessing consumer data from social media, blogs,

and mobile devices to determine sentiments and feed predictive models for customer acquisition, conversion, behaviors and patterns. [5]

Big Data: The Key to Thriving in Banking & Financial Services [By Kamal Mishra, June 4, 2014 Liquid Hub,Inc.]

According to Kamal Mishra, More than 40% of Banks ramp up to launch big data analytics business and technology strategies. This means improving the experience for existing customers – leading to revenue growth through targeted cross-selling – while simultaneously improving efficiency and decreasing costs. Banks have the data that will help them do this. As customer interactions in banking move from in-person to digital channels, you not only have to react faster; you must also be able to predict future behavior. Faster analytics means you'll be able to detect changes in customer behavior in real time during digital interactions. In turn, you'll be able to improve customer experiences and make relevant, real-time offers with higher acceptance rates. Faster analytics also mean your predictive modeling results won't just get delivered more quickly – because with optimization techniques, you'll be able to identify the best future action to take considering both financial and organizational constraints. By using high end predictive analytics, banks can Achieve better operational efficiency, which improves IT while reducing spending, Acquire and retain profitable customers by delivering higher value, improve risk management – market, credit, operation, liquidity and Strengthen the integration of social media with business processes and decision making. [6]

Hadoop Analytics for Financial Services <http://www.clouderaworkinnovations.com/hadoop-analytics-for-financial-services.html>]

This article illustrates how big data and hadoop can help financial services. Today every major financial services company faces the challenges of massive data volume in multi-structured formats. Financial companies have more access to customer data than ever before. But they know less and less about those customers. Hadoop enables the massive data intake needed to keep pace with today's digital world by capturing and analyzing all customer interactions. [7]

Big Data: Science Metrics and the black box of Science Policy by **Julia Lane**(Senior Economics Director, American Institute of Research) Research Trends Special Issue on Big Data Issue 30 September 2012.

According to author Big data offers an enormous opportunity to advance the science of science policy making the links, so that science funders have new understanding of what is needed to foster science, will enable new light to shine on what has hitherto been a rather black box within which miracles occurred [8]

Mining Big Data: Current Status, and Forecast to the Future by *Wei Fan Huawei* (Huawei Noah's Ark Lab , Hong Kong) and *Albert Bifet* (Yahoo! Research Barcelona, Spain) -2013.

This paper presents some insights about big data and big data mining, Analysis tools, the main concerns and the main challenges for the future that researchers and practitioners will have to deal during the next years.

According to authors Big Data is going to continue growing during the next years, and each data scientist will have to manage much more amount of data every year. This data is going to be more diverse, larger, and faster. Big Data is becoming the new Final Frontier for scientific data research and for business applications. We are at the beginning of a new era where Big Data mining will help us to discover knowledge that no one has discovered before. [9]

Future direction

The move from in-person to online banking has allowed banks to offer more convenient, functional and quality services. However, online banking comes at the cost of personal services. Customers share their views and experiences about services across systems and social networking sites. The growing number of channels through which customers communicate has resulting in generation of massive amount of multi-structured data which creates challenges for every major bank. This huge amount of data with various data types which is unmanageable with traditional RDBMS and analytical tools is very valuable to take effective business decisions. Banks needs to understand what their customers are saying about their products and services to create more personalized banking experiences by tracking of user interactions across communication channels as well as by approaching existing customers personally. This can allows banks to categorize customers dynamically and experiment with unique, more personally targeted offers in order to ensure customer satisfaction. Big data technologies like Hadoop can be used to analyze comments from communication channels to get relevant information and transform the business decisions for the future.

In future, the research will expanded to develop conceptual framework for crunching this huge multi-structured data and identifying the customer behavioral patterns by studying the existing banking policies, services and different marketing strategies for customers. The present study will also be stretched to analyze the reviews and experiences of customers about existing services, products and marketing strategies of various banks like Public Sector, Private sector and predict customer behavior for future action plan by developing big data analytics using big data technologies, which will give the explosion of customer's hidden behavioral patterns from large amount of data from terabytes to zetta bytes.

This study will also help to bridge gap between what customers want to do and what they actually do. Banks will able to provide the customers with best e-services based on the customer's perspective within a less time period, the accurate and relevant information to the customer every time and minimize waiting time and can able to maximize the customer's satisfaction ratio and profit. The overall objectives of this research are to capturing, curating and analyzing large set of data to extract real value to understand user behavior for personalized banking services.

Conclusion

A huge amount of data flows into the systems daily and there are multiple data sources that we need to aggregate data from. The research will provide banking industry with greater opportunities by exposing customer's hidden behavioral patterns and helps to bridge gap between what customers want to do and what they actually do. This information will be useful to make business decisions and improve services to increase operational efficiency and create new product or markets to gain the customer's satisfaction and maximize profit.

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