

# PROSPECTIVE ROLE OF BIG DATA AND IOT IN CUSTOMER RELATION MANAGEMENT

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## ABSTRACT

*Big Data is referred as the enormous amount of information businesses collect from online and offline sources. Various sources of big data include websites, social networks, mobile apps, software, documents, computer logs, sensor networks etc. This explosion of data, however, isn't necessarily significant because of its size, but because of what it can do.*

*Big data is often described in terms of the three V's — volume, velocity and variety. The benefit of the Big Data is to do with driving action and value out of data by applying algorithms and predictive models to solve specific business problems.*

*Simply put, Big Data delivers all types of intelligence that helps businesses make better decisions. CRM- Customer or Consumer Relation Management, is a system that businesses use to manage how they work with existing and prospective customers. CRM is used mainly by salespeople. CRM process can be automated using open source software. CRM software provides a centralized location to store, view and organize customer information.*

*CRM systems were developed to help sales representatives be more efficient and spend more time in selling. CRM software is also a reporting tool for tracking the health of sales pipelines and accounts. When used correctly CRM helps small, medium and Large businesses in several ways.*

**Keywords:** *Big data CRM, IoT CRM, Data mining in CRM, small business CRM*

## I. CRM AND BIG DATA

Big data CRM (big data customer relationship management) aims at integrating big data into a company's CRM processes. By integrating big data with CRM company's intend to improve customer service, calculate return on investment based on customer behaviour. Companies struggle, in general, to make sense of big data because of its sheer volume, the speed in which it is collected and the great variety of content it encompasses. Tools and procedures are evolving in order to help companies house and examine these large amounts of data and help companies move toward making data-driven decisions.

Big data CRM's[1] goal is to combine internal CRM data with customer sentiment data that exists outside of the company's existing system, such as on social media networks. By finding patterns and trends in this data, sales opportunities and adjustments to product and service offerings can be made to boost profits.

Big data combined with CRM data enhances customer behaviour analysis. This will lead to real time analysis and predictive modelling of data which in turn improves customer relations. Inbound and outbound interactions of the customers can be combined together across all channels and applying analytics to achieve big data CRM is of vital concern to companies. Because of the huge amount of data, inflexible architectures, inability or unwillingness to adopt systems using advanced algorithms or other machine-learning technology big data cannot be translated into actionable business information.

Big data CRM requires powerful data integration capabilities as well as data quality and cleaning that needs to be addressed before any value can be extracted from analysis. Several Open source tools like Hadoop, Lumify, Talend Open Studio for Big Data, HPCC Systems Big Data, Apache Storm, Apache Drill, Apache Samoa, Ikanow etc., are available through which costs of implementing the big Data CRM can be reduced.

Big data helps organizations in data-driven decision making by integrating into a CRM solution. Businesses can predict customer behaviour, improve customer service, and calculate ROI more accurately.

Consumer behaviours can be analysed by collecting big data and can extend a better service so that. turn outs can be improvised. Big data can provide businesses with metrics on sales, marketing and other areas to gauge performance and quality. It can also help make better forecasting decisions by allowing for real-time decision-making as well as giving information on product inventories, customer segmentation and assist in the development of products and services.

Big data refers to large amounts of either customer transactional data or analytical data. This can also be structured, or easily quantified in charts, graphs or other standard record-keeping applications, or unstructured and contain things like audio, video or other images.



Fig 1. Output from Big Data Analytics

Fig 1. represents an example for Big Data Analytics. The individual users' behaviour was identified using the log data. On which point while looking for products on the website did the customers start looking for the nearest store to buy that product? As demonstrated from the chart, the first visit to the site is the best chance to convert this prospect. By the third visit, you are likely to lose them altogether given that very few prospects return to the site after visit number 3. And while, as the chart shows, the probability of locating a store may go up from the 4th to the 10th visit, the universe of consumers actually returning to the site four or more times is so small that capturing them during visits 1-3 becomes critical. The above chart provides the kind of insight that can help a marketer take appropriate action like produce targeted promotions for the kind of products a user is looking for and run targeted remarketing campaigns, especially during a second and third visit.

## II. USING THE K-MEANS TO ANALYZE DATA IN A BIG DATA

Big data from various data sources is extracted into a Big Data Store like Hadoop File Systems (HDFS) or Databases like Cassandra, Hive etc. This is analysed using the potential variables. Data analysis and clustering happens in the **Big Data** system. Initially data in the Big data system is prepared for clustering the data using K-means. In this case, a table to contain information about usage habit or other attributes is prepared. For example, the information contained in this table includes number of visits made into the website, number of products purchased, pages visited, number of calls made from the phone, and others. This table has several rows, each with information about one customer. Customers are identified by means of Customer ID.

In creating segments, for instance, a mobile phone company could target three segments from the whole pool of its clients, namely those making short calls and few calls in a day; those making calls at average duration and frequency and during business hours; and those who make long duration calls at business hours and weekdays. The segmentation results in a table that categorizes the customers into three segments. That is the simplest example: in an average case, we are talking about a company that must use its CRM technology and Accounting and ERP systems across the world, its accounting systems, website data, and platforms built on mobile phones and other sources to collect data that is very diverse. In other words, the diversity of data collected can be so large.

Before running the algorithm, one must define the type of data to be input and output into the algorithm.

Using K-means in partitioning data has still one problem: identifying the number of clusters required. This is an input before running the procedure. The number of cluster chosen will affect results although all the parameters will make a contribution. Some of the techniques recommended for choosing the number of clusters to use include the explosive two steps and the internal index comparison procedures. Many also used heuristics, which refers to use of indices, graphs and dendrograms.

Others use subjective opinions together with the heuristics. Others used subjective assessment. Studies show that a majority (two thirds) use 3, 4 or five clusters[2] regardless of the problem involved, variables, segmentation nature and the number of respondents in question. One can also choose various clusters and generate various results, and then determine the more stable solution. One might also discuss the produced results with the management.

Another way of determining the number of clusters is to use the Elbow Criterion. In this case, the rule is that adding an extra cluster should not add any sufficient information. One plots a table of different number of clusters against the results and it is possible to note where the “elbow” is, i.e. where the intra-cluster distance decreases the largest from the one number of cluster to another (as is the case with a elbow of a hand). You will choose the number where elbow is.

Before the results are used or implemented, it is necessary to use the external and/or internal means of validating output. External means include unary measures (which compares a single output clustering result with some known “gold standard” or “ground truth”); and binary measures (compares two outputs such as partitions for similarities and agreements). Internal measures include compactness (which assesses intra-cluster variance and homogeneity of data sets), connectedness (which assesses data sets to check how connected they are with their group data items and densities, and separation (assesses how one cluster is separated from the other), among other methods.

While there are an abundance of possibilities made available using big data, there are also several obstacles. These include incomplete data, scale, complexity and privacy concerns—currently leaving a gap between big data's potential and its realization.

### **III. USES OF BIG DATA IN CRM**

Big data can also refer to the emerging technology used to store and process the large amounts of data. The data can be transactional (e.g. social media) or analytic (e.g. clicks). It can also be structured or unstructured and include text, audio, video and images.

There are 5 main categories of Big Data. They are as follows:

1. Social media – used to understand consumer sentiment.
2. Server logs – used to deliver responsive IT.
3. Web click stream – used to gain granular customer segmentation.
4. Machine/sensor – enabling predictive analytics.
5. Geo location – optimizing global logistics operations.

Big Data can create a Big Value in CRM. With big data, businesses can collect more accurate and detailed performance information on everything from product inventories to customer sentiment, and therefore expose variability and enhance performance.

Many important companies are using Big data collection and analysis to make better decisions

Big data allows narrower customer segmentation, resulting in more accurately customized products and services. Big data can be used for development of future products and services.

Big Data is more relevant to CRM. Big data has the potential to change the way companies manage customer relationships by offering businesses powerful new tools, capable of identifying sales opportunities and analyzing customers' responses to products, by combining internal data with comments made on social networks.

Using big data and CRM analytics[3] to find associations, identify new patterns and identify new trends that allow a company to shape customer experiences for increased engagement and better profits is a great way to bring the perspective of the customer into business decisions.

### **IV. BENEFITS OF INTEGRATING BIG DATA INTO CRM**

**Superior customer analysis** can be done using Big Data. All customer touch points, including social media, email, internet and call centre, allow CRM and big data to segment customers according to actions. Customer trends can be mined from big data and used to predict needs, directing product development and promotional efforts.

**Big Data helps in customer-facing operations** – Big data will provide businesses with sales, marketing and customer service performance metrics. With big data, organizations can predict and determine ROI and use it to endorse additional CRM investment.

**Big data aids in better decision making**– Once the value or lack thereof in customer-facing operations is made clear, businesses can make course corrections and better decisions going forward.

**Predictive Modelling** – Using big data, businesses gain the ability to predict how customers will respond in the future, based on demographics and behavioural history.

**Benchmarking** – A powerful component of big data is the ability to implement comprehensive benchmarking over time, enabling organizations to define vital indicators such as customer sentiment, retention and cost vs. revenue per service call. Once the areas that need improvement are emphasized, companies have the tools necessary to rise above industry standards.

## **V. BIG DATA FOR SMALL BUSINESS CRM**

Big Data and CRM are connected in that CRM extracts value from Big Data by turning it into smart data and by integrating it into a CRM system. This helps employees understand the who, what, where, when and why before they connect with the customers.

Small businesses can glean a large amount of data that can help them in their sales and attraction of new clients. Some examples of these types of data include the following:

- Company name and full information, with the right contact people and decision makers within the company.
- Social media information — like company news — that can help attract potential clients.
- A historical record of the interaction with the prospective company, making the relationship more personal.
- A saved history of all the projects, opportunities and proposals with a prospective client, allowing employees to better understand the prospective client's needs and prepare improved and more customized proposals.
- An enhanced understanding of potential revenue, based on the CRM upcoming opportunities and their potential to be converted into a profitable project.

In reality, this much data can be overwhelming for small businesses. The key is to gather only the data you need the most

## **VI. CRM WITH BIG DATA AND IoT**

Smart businesses will often take high-volume, low-value data, analyze it and interpret it to drive value by reducing costs, making smarter decisions, and then building new, IoT-enabled[4] products and services.

For businesses to take the greatest advantage of IoT, they will need to define a comprehensive approach to unifying a wide array of devices within a data centre with one goal in mind: extract the most useful insights as quickly as possible, and turn those insights into action.

The first challenge involves the data itself—the massive, growing volumes of device data that put pressure on the systems and software required to acquire, store, analyze, and act on it. The next challenge is the growing array of external devices that IT must integrate with internal IT systems. This leads directly to the third challenge that is securing data from an edge device to the data centre.

The Internet of Things creates limitless possibilities for enterprises in any industry to explore new ways to use big data to drive business growth. By taking a holistic approach from the data centre to end-devices and gateways, CIOs can deliver tangible benefits across a broad spectrum, from better customer service to a more efficient supply chain, and beyond.

**VII. CONCLUSION**

As Big Data takes centre stage for business operations, data mining becomes something that salespeople, marketers, and executives need to know how to do and do well. Companies and organizations are using data mining to get the insights they need about pricing, promotions, social media, campaigns, customer experience, and a plethora of other business practices.

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