BUSINESS INTELLIGENCE AND THE AUTOMOTIVE INDUSTRY

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Abstract:- A Business Intelligence software for an automotive dealer or an automotive company offers a comprehensive study of the market, the customers, potential customers etc. We can get an overview of all the sales outlets and departments , to make effective decisions based on logical and clear indicators.

Index Terms - Business Intelligence, Big data, Automobile data.

I. INTRODUCTION

This research paper gives an overview of use of Business Intelligence systems for the automotive industry. In the first section of the work we will explain why is Business Intelligence needed in Automotive Industry, and what it demands. In the second section we will see about some data collection techniques . For the third section we will see cases of Big Data for automobiles .

II. MOTIVATION

Big Data is everywhere . In recent years , there has been an increasing emphasis on big data, business analytics, and "smart" living and work environments. Though these conversations are predominantly practice driven, organizations are exploring how large-volume data can usefully be deployed to create and capture value for individuals, businesses, communities, and governments(McKinsey Global Institute , 2011)[1]. Organizations have jumped on this bandwagon of using ever-increasing volumes of data, often in terabytes or pentabytes worth of storage capacity, to better predict outcomes with greater precision. [1]

Automobile industry faces new challenges in the market today. Improvements in technology, new entrants, shift to mobility as a service and change in customer preferences for more connected capabilities are some of the major challenges that the auto industry faces. To remain competitive, it becomes important for the auto industry to leverage the power of Big Data & Analytics.[3]

Shifting marketing conditions , globalization, increased competition , cost pressure and volatility are leading to a change in the market landscape. The rate of technology change continues at a fast pace, irreversibly transforming how business operate. With autonomous or self-driving cars, changing ownership, purchasing power of the common man and usage models and heightened customer expectations, the automotive industry is on the brink of a revolution.

III. WHAT IS "BIG DATA" ?

Big data is generated from increasing plurality of sources, including Internet clicks, mobile transactions, user-generated content and social media as well as purposefully generated content through sensor networks or business transactions such as sales queries and purchase transactions. In addition, demonic, health care, engineering, operations management, the industrial, Internet and finance all add to big data pervasiveness. These data require the use of powerful computational techniques to unveil trends and patterns within and between these extremely large socio-economical datasets.[4]

New insights gleaned from such data-value extraction can be meaningfully complement official statistics, surveys and archival data sources that remain largely static, adding depth and insight from collective experiences and doing so in real time, thereby narrowing both information and time gaps.[4]

For example, a participant in a Formula 1 car race generates twenty gigabytes of data from one hundred and fifty sensors on the car that can help analyze the technical performance of it's components, but also the driver reactions, pit stop delays and communication between the crew and the driver that contribute to overall performance. The emphasis thus moves away from outcomes (win/lose race), to instead focus on each proximal, contributory element for success or failure mapped for every second during the race.

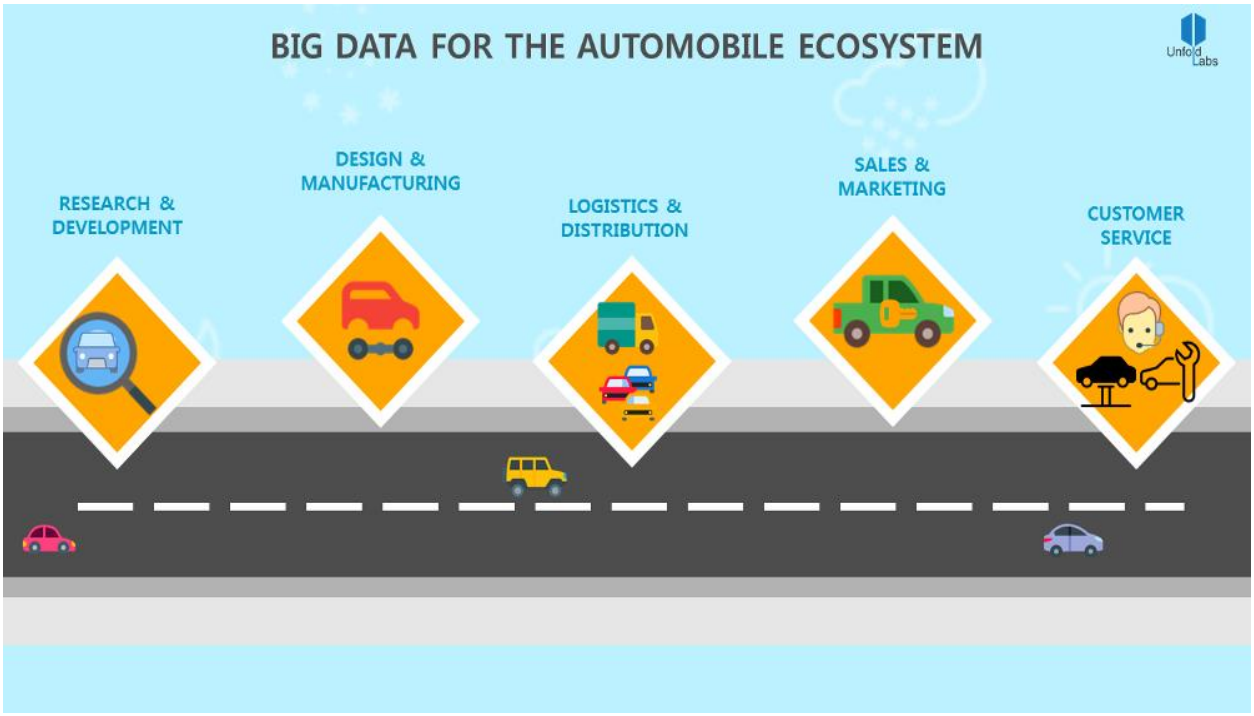

Figure 1.Various domains for use of Big Data in the Automotive Ecosystem

(https://medium.com/@Unfoldlabs/one-for-the-road-big-data-the-automobile-industry-bb630f098d8c)

IV. DATA COLLECTION TECHNIQUES

The data collected from automobiles can be simple sensor based techniques to record and monitor performance, maintenance and behaviour of critical automobile systems, or more sophisticated GPS and satellite based techniques such as tracking vehicle position and recording external conditions.[3]

Recently, standards organizations have allocated new wireless communication channels specifically designed for auto- motive use. This has enabled new technologies such that automobile systems can now rely on On-Board Units (OBUs) to report vehicle information directly to other vehicles or to a central server. Data collection techniques for automobiles gained maturity over the years by using current technology offerings like mobile devices, wearable's, Big Data, Business Intelligence, Cloud and Social Media. The major focus of these collection techniques was to improve customer experience and achieve better vehicle health.[6]

More recently, the rising use of cellular technologies has made vehicle-based data collection much more convenient. One new technique, called floating cellular data (FCD) , has been proposed. This technique uses anonymized cellular network data from mobile phones of drivers or passengers inside vehicles.[8]

Now, for example say we want to develop a car for a company, we will first research the segment of the car which we want to target or first research the possibilities of maximum potential profit lies in which segment of cars eg. sedans, hatchbacks, MPV, SUV, etc. and then decide in which segment to target.

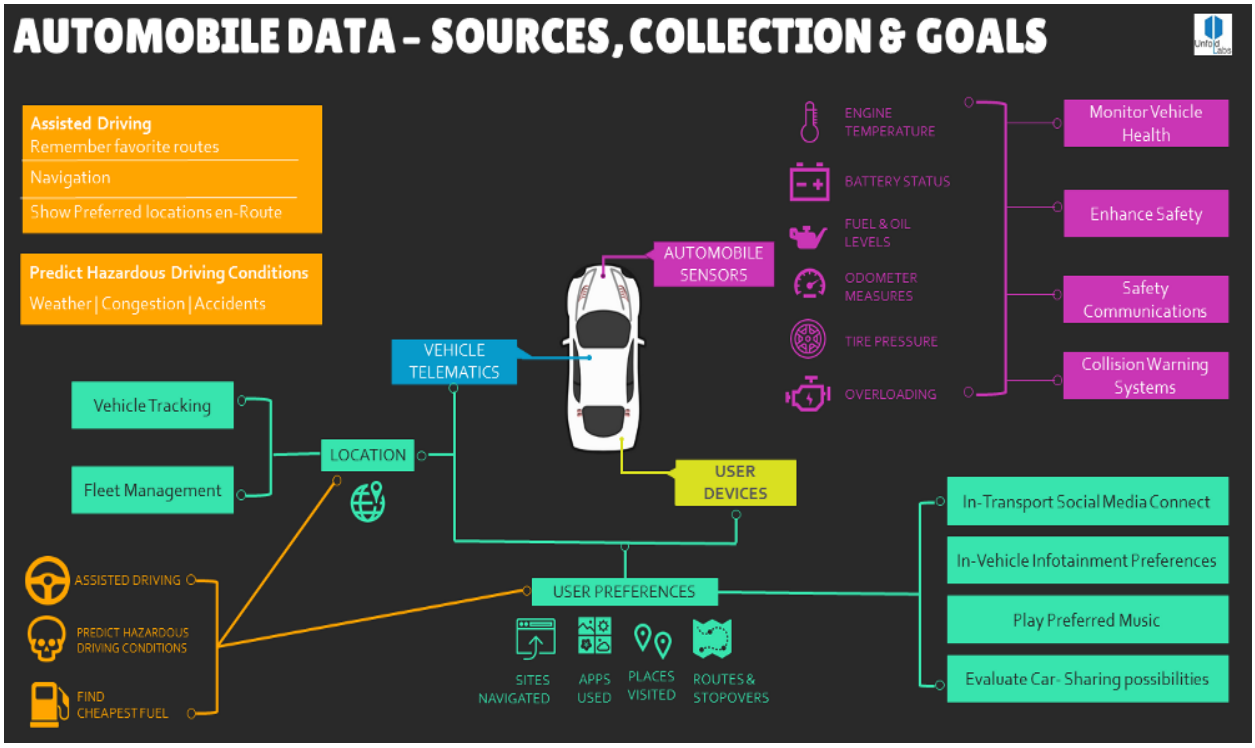

Figure 2.Various ways to collect data from an automobile.

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Then we look into how the design will be, what manufacturing techniques and equipments will be needed, the technology which will be put into the product, its total cost of production, factory setup and then the selling price, will be decided with respect to its direct competition in the market. The cost of logistics, distribution of the product and spare parts in the areas where there is more demand or where there is a good amount of potential and elsewhere. Similarly the marketing of the product, depending on its target customers and the sales

we expect depending on region to region. We cannot just stop after releasing a product, we have to follow through and cater to after sales services of our customers.

All of this data can be obtained through the existing dealerships, surveys, customers feedback, sales pattern, demand or need for a particular feature etc. Following the above steps we can make a product which can return profits to the company in a short term itself.

Insight and intelligence are critical in just about any field, but in a capital-intensive business such as making cars and trucks, having clear, accurate, real-time visibility into supply chains and distribution channels can mean the difference between success and failure. It's one thing for a retail chain to swap out inventory based on market conditions but an entirely different matter for car companies to retool factories, change distributor agreements, and make the other changes necessary to ensure quality and protect the bottom line. That's why BI isn't a luxury in the auto industry: in a vertical where product development is measured in years, not days, it's a necessity.[9]

BI is also critical even after cars and trucks leave the factory. One automaker is aggregating data from 170 worldwide production facilities to segment and analyze data at the car level, and data from embedded systems is also incorporated into the data warehouse. Consolidating the data and centralizing the analytics enable correlation and help manufacturers to identify trends allowing automakers to address safety issues, possibly saving lives.

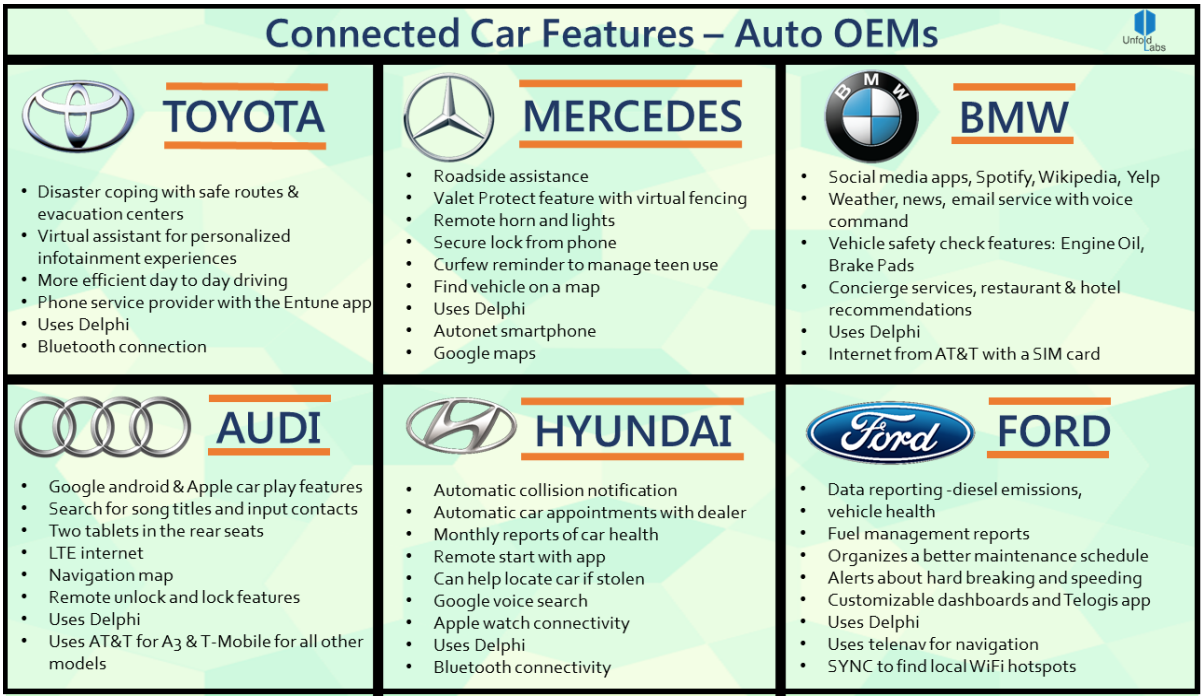

Figure 3. Lists of connected car features made available by various Original Equipment Manufacturer (OEM) in their products.

(https://medium.com/@Unfoldlabs/one-for-the-road-big-data-the-automobile-industry-bb630f098d8c)

V. CASES OF BIG DATA FOR AUTOMOBILES

The Connected car : A vehicle with internet and Wi-Fi access helps the user to be connected on the go and become a smart vehicle that offers assisted/autonomous driving, safety alerts, notifications about its surroundings and keep track of vehicle health. All this data can also be sent to the vehicle manufacturer so that

they can collect this data and evaluate the vehicle's performance, monitor its health remotely and the owner of the vehicle can be informed of any problems in the vehicle beforehand.

Using the internet capabilities inbuilt in the vehicle or from the users mobile the vehicle can be tracked. Technologies like Android Auto, Car Play by Apple and Windows Embedded Automotive 7 that help keep the cars connected are generating a lot of interest. It is estimated by 2020, 90% of new cars will have connectivity setup, making Big Data & Analytics a crucial piece of technology.

The features that OEMs offer for connected cars prove that it is in fact Big Data & Analytics that is all set to spearhead a technology revolution in the Automobile Industry.[3] There are 5 ways a vehicle can be connected to its surroundings and communicate with them :

1. V2I "Vehicle to Infrastructure": The technology captures data generated by the vehicle and provides information about the infrastructure to the driver. The V2I technology communicates information about safety, mobility or environment-related conditions.
2. V2V "Vehicle to Vehicle": The technology communicates information about speed and position of surrounding vehicles through a wireless exchange of information. The goal is to avoid accidents, ease traffic congestions and have a positive impact on the environment.
3. V2C "Vehicle to Cloud": The technology exchanges information about and for applications of the vehicle with a cloud system. This allows the vehicle to use information from other, though the cloud connected industries like energy, transportation and smart homes and make use of IoT.
4. V2P "Vehicle to Pedestrian": The technology senses information about its environment and communicates it to other vehicles, infrastructure and personal mobile devices. This enables the vehicle to communicate with pedestrians and is intended to improve safety and mobility on the road.
5. V2X "Vehicle to Everything": The technology interconnects all types of vehicles and infrastructure systems with another. This connectivity includes cars, highways, ships, trains and airplanes.[11]

Automated Insights for Design & Production:

Auto manufacturers now use data related to real world driving experiences across their customer segments, the usage preferences and service analysis to understand the gaps in basic parameters like safety, fuel efficiency, battery life and other factors governing the overall performance.[12] The insights gathered is being used to design automobiles that are safe and personalized to customer preferences. Manufacturing simulations are helping with continual improvement cycles, with the cohesion of Predictive Analytics and Big Data.

Assembly line observations can help improve workforce and operational efficiency. Big Data helps make the Design & Manufacturing process more informed and helps deliver better transportation systems.

Manufacturers have access to huge volumes of data in the form of the information captured by shop floor management equipments (handheld devices, CMMs, vision systems).[13] Even though the company may have several terabytes of measurement data, unless it's aggregated in some way, it can't really be considered big data, in the sense that it can provide new and valuable insights.

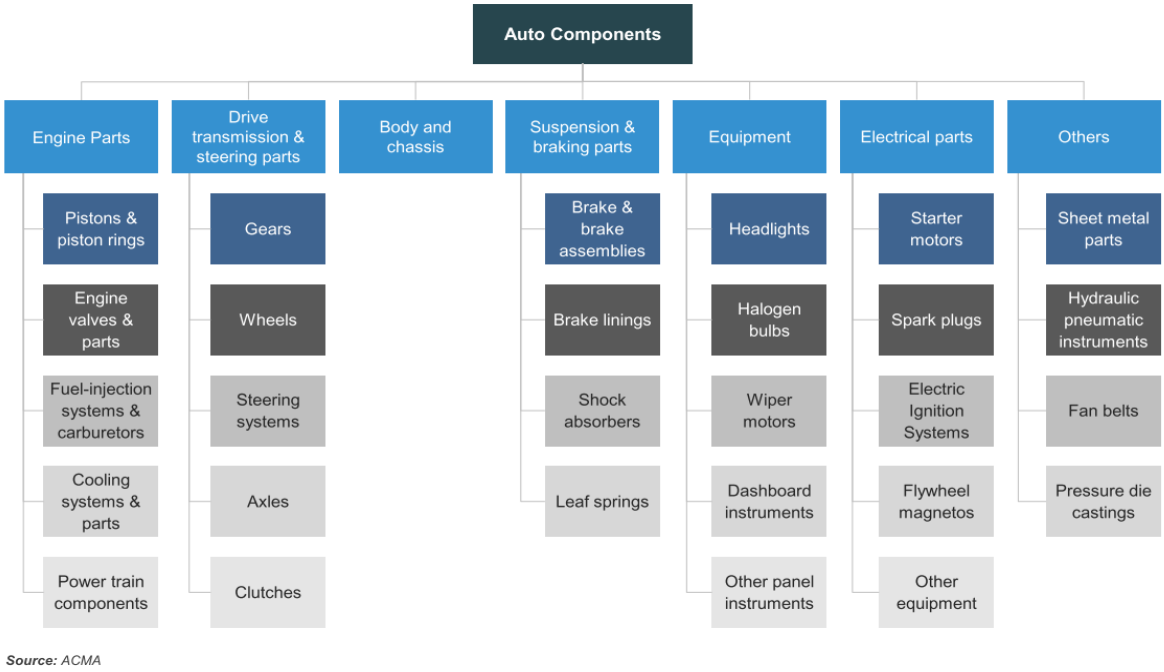

Figure 4.Segregation of components used in automobiles.

(https://www.ibef.org/download/auto-components-dec-2018.pdf)

Predictive Maintenance, Automated Service Scheduling & Aftermarket:

Using Predictive Analytics to foresee problems in vehicle parts to prompt timely actions and ensuring better vehicle health. A logical prognosis also pre-empts any trouble with the automobile and service schedules are timely and automated.[3] Predictive Analytics is the analysis which is used to make predictions about unknown future events. Predictive analytics uses many techniques from data mining, statistics, modelling, machine learning and artificial intelligence to analyse current data to make predictions about the future.[15] This helps the manufacturer to take informed and better decisions. From the specifications of the product we can predict in what time or usage it should be checked, maintained or replaced altogether.

Automobile Financing:

Slowly but steadily the purchasing power of the common Indian man is increasing. Companies specializing in

auto finance are analyzing data pertaining to customer financial history and preferences. By combining this analysis with demographics & geography, organizations have launched ideal financing schemes best suited to customer requirements — leading to increase in business and ensuring safety from likely defaulters.[3] So that it is beneficial to the company and convenient for the customer. It helps increase in sales as the customers do not have to deal with the hassles of financing from somewhere else as it can be provided by the dealer itself. In India depending on the cost of the product and the assets of the customer, one can avail loans from banks which range from a time period ranging from 1 to 7 years.

Supply Chain Improvements:

Automotive manufacturers also compare costs, reliability and quality of different components within their supply chain to decide the best fit for their automobiles using Big Data & Analytics. There is a lot that goes in manufacturing a vehicle, which means that automakers typically have more partners and larger supply chains to deal with. Say for example the transmission of a car, if the supplier who supplies gears is delayed then the whole production is delayed which affects the output of the company, so the manufacturers have to have good supply chains and some in spare also. Manufacturers also have to think about the supply of parts and services to their service centres for maintenance and after sales service of their products. Big Data is also being used in predicting demand thereby helping streamline the procurement process and making it effective and cost-efficient.[16] Depending on the suppliers and their records, we can make the right choice of choosing the right supplier.

Vehicle Sales & Marketing:

Vehicle marketing becomes more meaningful when data collected is used for sentiment analysis and market segmentation. This also helps in campaign management and other vehicle marketing tactics. Facts and figures gathered using Big Data gives insights to dealers and other partners enabling them to strategize and boost sales. Personal marketing is on the rise in digital marketing. Customer profiles are assembled using insights gained using their search patterns, enquiries, etc. In integrating personalization into software systems and enterprise solutions to arrive at better conversion rates.

VI. CONCLUSION

The automobile industry is constantly evolving, with the increase in competition in all segments, companies are trying their best to analyze customer pattern and the features they demand in a vehicle. Various cost cutting techniques have been implemented after studying the manufacturing data. Various innovations are being tested and implemented in the automobile industry with use of big data. The automobile industry is beginning to expand its boundaries from traditional notions to innovative concepts such as Electric, Connected & Autonomous vehicles and Mobility services using Big Data and advances in technology. Tesla is one of the best example for this. All of its cars are connected and monitored by the company directly, they studied the market, developed infrastructure for electric vehicles, took help from the governing bodies, and today have products that people are lining up to buy and have put down payments to get their own Tesla in the coming years. Big Data is for sure going to be a big game changer for the road in the near future.

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