

Implication and expectation on data analysis in automobile industry

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Abstract. In the current automobile industry, the application of data analysis is in every corner of the industry. For example, BMW used predictive analysis to decide the new factory location. Deloitte specifically wrote a report about why the automobile industry should use more data analysis in production. Automobile expects more technological changes, and predictive analysis is a significant part that attracts automakers' attention. This paper shows how data analysis helps human resources, accounting and finance, product design and development, supply chain and logistics, sales and marketing, and support services. The further study and report indicate that predicted analysis can increase consumer experience and collect the data in each detailed step.

Keywords: Predictive Analysis, Data analytics, Automobile Industry.

1. Introduction

In the 1950s, according to the US census, suppliers sold 58 millions of cars which meant each one new car for three US citizens. What's more, the 1950s also generated some significant innovations such as the V8 engine, seat belts, etc. Just like Barra said, the automobile industry was highly varied in transforming technology and applying energy methods. Automobile manufacturers had always wanted to reduce the risk factor in driving and use new energy to reduce pollution. They realized that appropriate data analytics usage would be an essential part of the future blueprint.

"I believe the auto industry will change more in the next five to ten years than it has changed in the last 50s" Said marry Barra, the CEO of General Motors, in 2017. Barra draw an attracting picture for future automobile industry which even better than the American Golden Age in automobile industry.

On the other hand, as more and more industries understand how data drive merchandising success, investors know that a company's ability to use data to further research and analyze wisely will be critical for attracting capital inflow and potential talent recruitment. Therefore, this paper focuses on the current data analytics by function and future applications of data analytics inside the automobile industry.

"Where is data smoke? There is business fire." So said Thomas Redman, President of Data Quality Solution. In modern automobile production, data is everywhere: product design, human resources, supply chain, etc. Automakers have started to hire more data analysis professionals since 2017, and more and more automakers understand the wise of using data more accurately.

2. Current applications of Data Analytics

2.1 Human Resources

The automobile industry had a strong focus on developing technology, which can be called "Talent management." Thus, Large car manufacturers all had their unique way of recruiting and working management. Us Tesla as an example, In Mayner's report, Elon mask required all employees to return to in-person work, and he is making a very clear attitude in no tolerance of remote working. Elon Mask also set a rule for 40 hours' minimum working time inside Tesla. In this way, Tesla wanted to relocate its talent resources to promote the production of the self-driving car and the production of electric cars. Thus, it was evident for the automobile industry to see the importance of talent. In McKinsey's analysis of how the automobile industry could win talent, the report concluded in three steps: attracting talent, developing talent, and retaining talent. As indicated in Figure 1 below,

McKinsey believed data analytics would be essential in drawing the road map and identifying each employee's value. In the Talent Wins graph, the report believed the current application of the data analytics would help identify each talent's value and put them into correct categories.

On average, auto suppliers outperform other industries on these talent practices; however, the lowest scorers lag other industries.

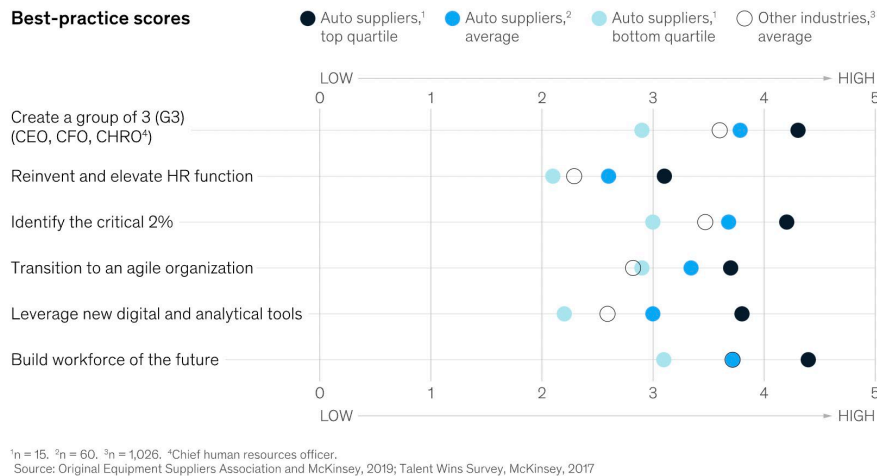


Figure 1. Talent Wins

2.2 Accounting and Finance

“Big data is the new oil.” So said by Nicolai Andersen is a partner and the head of innovation at Deloitte Germany. Big data analytics has been widely used in accounting and finance inside the automobile industry. In the Deloitte’s report, one of the most critical applications is the calculation of price elasticity analytics. As the Figure 2 shown below, this technology has a significant impact under the COVID since it will help the company calculate the customer’s purchasing power and market accepting price to optimize the best market price, which helps in optimal pricing range to realize the highest performance.

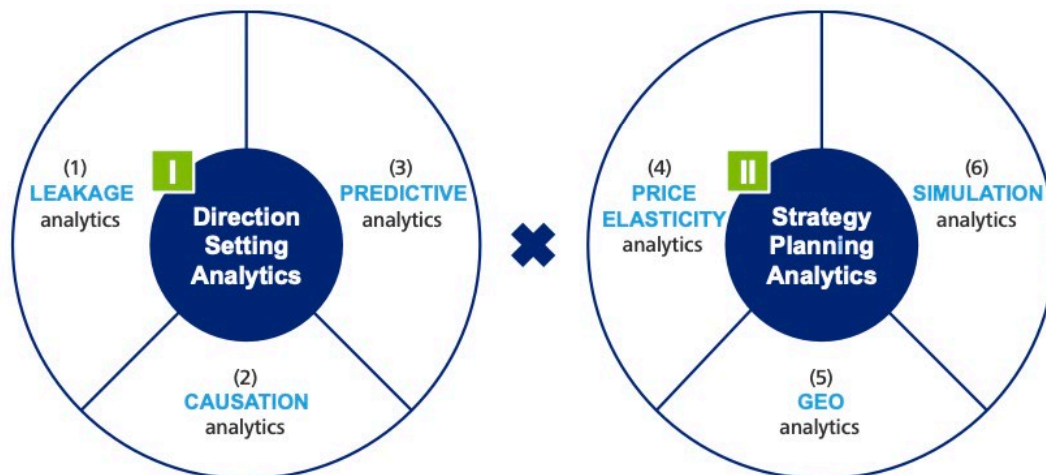


Figure 2. Accounting and Finance

2.3 Product design & Development

Data analytics precisely predict consumers’ choices and analyze what their most flavor product is. In emeritus’s report, the best function in applying data analytics inside the automobile industry is personalized market choice and communication. For example, in the Figure 3, on the BMW official website, the only BMW factory in the US only produced X3, X4, X5, X6, and X7 SUVs. BMW indicated that US consumers purchase SUVs more than any other model. Thus, BMW cleverly designed its factory to serve US consumers.



Figure 3. Factory

2.4 Supply Chain and Logistics

“Globalizing operations to take advantage of high-growth markets, driving innovation strategies that seek to optimize the manufacturing process,” Said Siddharth Patil, head of the Analytics and Information Management practice in Deloitte US. In Deloitte’s report, Patil pointed out the most important application of data analytics in the supply chain is developing a risk-resilient supply chain. As show in the Figure 4, data analytics help automakers to reduce the risk and management responsibility inside the transportation process. A supply chain with a high ability against risks such as COVID will help the automakers to provide their products under any circumstance.

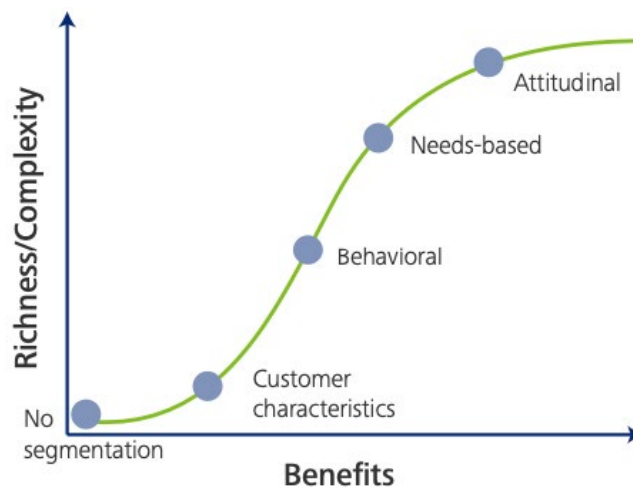


Figure 4. Supply Chain and Logistics

2.5 Sales &Marketing

According to US Statista, the 2021 automobile market expected a 13.29 billion dollars in the advertisement spending. Automobile market had always been a profitable and highly competitive market. In BMW annual report 2019, the report showed BMW best-selling region and data analytics on each specific costs. For instance in the Figure 5, the BMW 2019 manufactured costs were increased by 9 percent compared by 2018. Data analytics did a huge job in the analyzing of costs in the analysis of annual report.

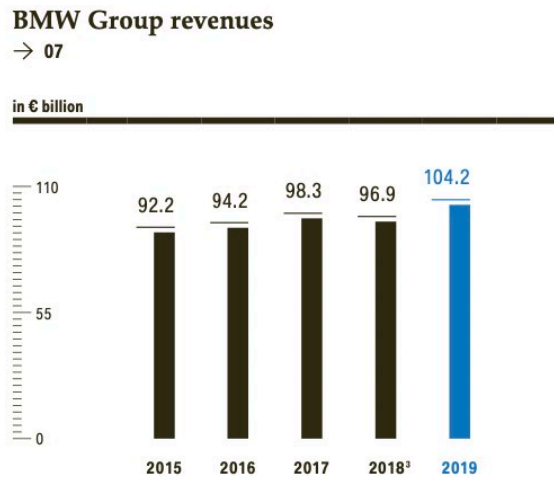


Figure 5. Sales & Marketing

2.6 Support Services

Data analytics can collect the geography data and analyze which locations may lack network stations. In BMW's annual report 2019, the geo-mapping analytics helped BMW build 31 new locations in 15 countries and 8 potential factory locations that would be processed. Geo-mapping analytics will combine local consumer performance and national purchasing level data to indicate a great network station for automakers. In the Figure 6, the BMW 2019 annual report give consumers a detailed description for future new location's services and expectations.

BMW GROUP PLANTS		
Araquari	Brazil	BMW 3 Series, BMW X1, BMW X3, BMW X4, BMW X5
Berlin	Germany	BMW motorcycles, Maxi-Scooters, car brake discs
Chennai	India	BMW 3 Series, BMW 5 Series, BMW 6 Series, BMW 7 Series BMW X1, BMW X3, BMW X4, BMW X5, BMW X7, MINI Countryman
Dingolfing	Germany	BMW 3 Series, BMW 4 Series, BMW 5 Series, BMW 6 Series, BMW 7 Series, BMW 8 Series, BMW M Chassis and drivetrain components Components for electric mobility Rolls-Royce bodywork, pressed parts
Eisenach	Germany	Toolmaking, outer body parts for Rolls-Royce, aluminium tanks for BMW Motorrad
Hams Hall	United Kingdom	Petrol engines for BMW, BMW i, MINI Core engine parts
Landshut	Germany	Lightweight construction components, electric drivetrain systems and special engines
Leipzig	Germany	BMW 1 Series, BMW 2 Series, BMW i, BMW M
Manaus	Brazil	Motorcycles
Munich	Germany	BMW 3 Series, BMW 4 Series, BMW M Petrol and diesel engines, high-performance engines for M models Core engine parts
Oxford	United Kingdom	MINI, MINI Clubman
Rayong	Thailand	BMW 3 Series, BMW 5 Series, BMW 7 Series BMW X1, BMW X3, BMW X5, BMW X6 Motorcycles
Regensburg	Germany	BMW 1 Series, BMW 2 Series, BMW 3 Series, BMW 4 Series BMW X1, BMW X2, BMW M
Roslyn	South Africa	BMW X3
San Luis Potosi	Mexico	BMW 3 Series
Spartanburg	USA	BMW X3, BMW X4, BMW X5, BMW X6, BMW X7, BMW M
Steyr	Austria	Petrol and diesel engines for BMW and MINI Core engine parts High-performance engines for M models
Swindon	United Kingdom	Pressed parts and bodywork components
Wackersdorf	Germany	Distribution centre for parts and components Cockpit assembly Processing of carbon fibre components
Rolls-Royce Manufacturing Plant Goodwood	United Kingdom	Rolls-Royce Phantom, Ghost, Wraith, Dawn, Cullinan*

Figure 6. the BMW 2019 annual report give consumers a detailed description for future new location's services and expectations.

3. Future application of Data Analytics

In the automobile industry, predictive analytics records the historical performance in the past and analyzes to digest a new insight for manufacturers. Thus, predictive analytics can often provide new test methods and reduce risk factors to boost the customer experience significantly. In this circumstance, one of the most implications in the predictive analysis is the predictive maintenance-PdM. PdM can help car manufacturers conclude the potential fixing part and combine the service system to obtain an accurate conclusion of a car's performance.

Overall, from my perspective, the predictive analysis can boost the consumer experience and raise the automobile industry's safety in the recent five to ten years. Investor who owned the future vision will see how predictive analysis changing people's life steps by steps. Therefore, the automakers who put faith in the transformation of data analytics will have more chance in the future leadership in automobile industry.

References

- [1] Khavanekar, A. (2022, April 30). Porsche China apologizes to car owners, consumers don't buy it: Chinese car owners are not so good at cheating. Gamingsym. Retrieved July 7, 2022, from <https://gamingsym.in/porsche-china-apologizes-to-car-owners-consumers-dont-buy-it-chinese-car-owners-are-not-so-good-at-cheating/>.
- [2] Ukrainian army relies on drugs to improve combat ... - inf.news. (n.d.). Retrieved July 7, 2022, from <https://inf.news/ne/military/bc41bf0fbdd3692eee038b7da3729d4a.html>.
- [3] Kikan, Deepak, Sumeet Singh Jasial, and Yudhvir Singh. "Predictive Analytics Adoption by Banking and Financial Services The Future Perspective."
- [4] Kumari, Rani, and Kavita Saini. "Automobile Industries using Data Mining and Predictive Analytics: An Industry 4.0 Approach." *India: Journal of Xi'an University of Architecture & Technology* 12.V (2020).
- [5] Lakshmanan, L. (2021, July 9). Predictive maintenance in the automotive industry-an insider's perspective. Medium. Retrieved July 7, 2022, from [https://medium.com/embitel-technologies/predictive-maintenance-in-the-automotive-industry-an-insiders-perspective-57388d008c9d#:~:text=Predictive%20maintenance%20\(PdM\)%20in%20the, and%20employing%20machine%20learning%20algorithms](https://medium.com/embitel-technologies/predictive-maintenance-in-the-automotive-industry-an-insiders-perspective-57388d008c9d#:~:text=Predictive%20maintenance%20(PdM)%20in%20the, and%20employing%20machine%20learning%20algorithms).
- [6] Automotive Predictive Maintenance Market. Transparency Market Research. (n.d.). Retrieved July 7, 2022, from <https://www.transparencymarketresearch.com/automotive-predictive-maintenance-market.Html>.
- [7] H. M. Hashemian, "State-of-the-Art Predictive Maintenance Techniques," in *IEEE Transactions on Instrumentation and Measurement*, vol. 60, no. 1, pp. 226-236, Jan. 2011, doi: 10.1109 / TIM.2010.2047662.
- [8] James, A. T., Kumar, G., Tayal, P., Chauhan, A., Wadhawa, C., & Panchal, J. (2022). Analysis of human resource management challenges in implementation of industry 4.0 in Indian automobile industry. *Technological Forecasting and Social Change*, 176, 121483.
- [9] Mayer, Kathryn. "Elon Musk Is Ending Remote Work. Will Other Employers Join Him?" *HR Executive*, 3 June 2022, <https://hrexecutive.com/elon-musk-is-ending-remote-work-will-other-employers-join-him/#:~:text=Elon%20Musk%20this%20week%20ordered,warn%20may%20have%20serious%20risks.&text=%E2%80%9CEveryone%20at%20Tesla%20is%20required,per%20week%2C%E2%80%9D%20Musk%20wrote>.
- [10] Doucette, Reed, et al. "Winning the Race for Talent: A Road Map for the Automotive Industry." McKinsey & Company, McKinsey & Company, 17 July 2020, <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/winning-the-race-for-talent-a-road-map-for-the-automotive-industry>.
- [11] Jordan, friedman. "How Big Data and Ai Are Transforming the Automotive Industry." Emeritus, 14 July 2022, <https://emeritus.org/blog/big-data-ai-in-the-automotive-industry/#:~:text=With%20data%20analytics%2C%20car%20companies,communications%20and%20share%20relevant%20content>.
- [12] Published by Statista Research Department, and Oct 25. "U.S. Auto Industry Digital Ad Spend 2021." Statista, 25 Oct. 2021, <https://www.statista.com/statistics/243603/projected-online-ad-expenditure-of-the-us-automotive-industry/>.