

ANALYZING THE IMPACT OF BIG DATA AND BUSINESS ANALYTICS IN ENHANCING DEMAND-DRIVEN FORECASTING IN RETAILING

Dr. Jaipal Rathod, Central University of Karnataka
Mr. Raj Kumar, Senior Manager, Punjab National Bank

ABSTRACT

Purpose: The purpose of this paper is to analyzing the impact of big data and business analytics in enhancing demand-driven forecasting in retailing sector in the Indian context. The study highlight the challenges and opportunities involving big data and analytics for enhancing the process of retailing. The retailing process involves different procedures such as gathering information, analyzing data, providing solutions so that critical business decisions are taken adequately. It includes the intensification of a large volume of data by using advanced technologies such as big data and business analytics so that retailing business is enhanced.

Design/methodology/approach: The study adopted secondary source of data from different over views of bigdata impacting on tetailing sector and study also examined that the application of big data and business analytics enhances the involvement of the customers and their interaction with the retailers during the retailing process. It helps in bridging the gap and establishing a good connection with customers.

Originality/value: The main aim of the research is to analyze the impact of big data and business analytics in enhancing demand-driven forecasting in retailing. The study also highlights the challenges and opportunities involving big data and analytics for enhancing the process of retailing. The research identified that big data and business analytics help in predicting future performance, price optimizing, and forecasting demand.

Managerial and Social Implications: the study helps retailers It was found that technologies also help in predicting trends and identifying target customers. Thus, it can be concluded that big data and business analytics are essential technologies that are highly used by the firm in the retail sector to capture customer experience, forecast sales, and provide normative decision suggestions.

Keywords: Big Data, Retailing, Analytics, Data Science, Automation, Forecasting.

INTRODUCTION

Retailing is defined as the procedure that is used by sellers to sell goods and services to the consumers by using different channels of distribution such as wholesaler, retailer, agent, and jobber so that profit earning is enhanced. The retailing process involves different procedures such as gathering information, analyzing data, providing solutions so that critical business decisions are taken adequately. It includes the intensification of a large volume of data by using advanced technologies such as big data and business analytics so that retailing business is enhanced (Insalaca, 2018). As per the survey conducted by McKinsey Global Institute, it was found that the use of big data in the retail industry has increased the profit margins by 60%. Big

data allows digital browsing of data, analyzing social platform data, procuring information, and assessing mobile custom information. It helps the retailer to assess the customer's wants and provide enhanced services effectively. For example, big data allows Wal-Mart to collect 1 million customer-related data each hour. It helps the company to analyze customer preferences and determine purchasing trends (Akter & Wamba, 2016). Additionally, a retail organization such as Amazon uses big data to gather, curate, and assess data so that critical business decisions are executed. Big data also provides the privacy of data, captures customer experience, forecasts sales, and provides normative decision suggestions. On the other hand, business analytics helps retailers to leverage their business by identifying target customers and serving them with profitable merchandise. Due to statistical business analytics tools, the retailers acquire transparent and secure consumer data that helps in expanding retail business exponentially (Shankar, 2019). For example, by using retail analytics, Apple reached \$5546 average sales per square foot. It helps the firm to spread its store capacities and provide consumers with enriched services.

AIMS AND OBJECTIVES

The aims and objectives of the given review paper are illustrated below:

1. To study the impact of big data and business analytics in retail.
2. To highlight the challenges and opportunities involving big data and analytics for enhancing the process of retailing.
3. To identify the planning and forecasting demand for big data and analytics in retail sectors.
4. To highlight the present and future aspects of big data analytics for enhancing the retailing process.

LITERATURE REVIEW

Overview of Big Data in Retail Sectors

According to Groves et al. (2016) big data is defined as the large set or varied sets of information that grow at an accelerating rate. It is categorized into two parts which are structured and unstructured in which structured data includes information that is managed by the firm through spreadsheets. The structured data is in the form of numeric presentations that is accessible by the firm in their databases. On the other hand, unstructured data is an unorganized form of information that is unorganized and difficult to be accessed by the firm. It includes information gathered from different sources such as social media platforms that helps in collecting facts related to consumer needs, preferences, and wants.

Raguseo, (2018) examined that the market of big data and analytics is growing at an alarming rate with more and more companies using big data to or take advantage of new opportunities such as learning about hidden values. As per the survey conducted by International Data Corporation (IDC), 2016, it was found that the big data and analytics have attracted more than \$122 billion in the year 2015 which grew more than \$187 billion in 2019 showing an increase of 50%.

Davenport, (2014) analyzed that big data technology such as Natural Language Processors or Hadoop is used by businesses belonging to different sectors such as retailing for cost reduction purposes, making informed decisions, and enhancing the quality of merchandise that is provided to the customers. For example, a semantic based evaluative investigative engine known

as Polaris is used by Wal-Mart in its working systems to look for products and information. The adoption of the innovative search engine within the working module of Wal-Mart has increased its sale by 10% to 15%.

Farbey et al. (1999) examined that the working of the business system in retail sectors is highly dependent upon customer interaction and meeting their needs and wants by providing quality products. However, in today's world, with the onset of the globalized environment and multiple retailing options (brick and mortar, e-commerce) the preferences of the customers are changing. Therefore, the retaining firm adopts new technologies such as big data to address the changes that are occurring in the competitive market.

Gregor et al. (2006) analyzed that the benefits that are received from technological advancements by the retail firms are classified into four parts which are transactional, strategic, transformational, and informational. While focusing on the transactional benefit, big data helps the firm to accomplish set objectives by increasing efficacy. It includes enhancing financial returns and decreasing operating costs. It also helps in synchronizing supply chain activities, improving communication with customers along with reducing costs by limiting the hiring process within the firm.

Porter & Heppelmann (2015) examined that strategic benefits are received by the firm upon adopting big data technology. It includes providing better quality merchandise at reasonable rates. For instance, big data technology has been implemented by the retailing company Babolat to enhance the quality of products and services. The company has put sensors in the racket which determines the speed, velocity, spins, and impact of the hit on the location in real-time. It helps in improving the game of the players and providing them better opportunities to improvise their game skills. The other strategic benefit of big data is that it helps in facilitating the internal process and provides quick solutions to the issues that are faced by the firm.

Willcocks & Graeser (2001) examined that transformational benefit such as the expansion of business capabilities is also received by the firm when it invests in big data technology adoption. Big data allows the firm to gather structured and unstructured information within a timeframe that is beneficial for future commercial transactions. It also allows the business to explore and expand its functionalities by providing a new business value chain which was not possible earlier systems of operations. For example, Fitbit uses big data applications which help the consumers to track their activities such as sleep patterns, diet, exercise, and other weight. The information that is collected by Fitbit through its devices could be sold to the insurance company as it would help insurance agents to propose health plans to consumers as per their health status and future requirements.

Dhillon & Backhouse (1996) examined that informational benefits are also received by the firm upon adopting big data in the form of consumer data and market workings. Big data enhances the ability of the retail firm to track the interests of the customers by recoding their likes, complaints, comments, purchase patterns, and preferences. It develops a single customer relationship management (CRM) file for each customer and provides insights about consumer likings and preferences. big data also provides effective communication and marketing tools such as email marketing, search engine optimization/marketing, and mobile marketing that promotes products to large audiences (El-Santawy, Ahmed, & El-Dean, 2012). It also helps in establishing communication with the customers through personalized email campaigns or community chats which helps in acquiring learning about customers. As a result, there is a high level of involvement of the customers and the establishment of interaction with the retailers

during the retailing process. It helps in bridging the gap and developing a good connection between the retailer and consumer.

Puccinelli, Goodstein, Grewal, Price, Raghurir, & Stewart, (2009) examined that technology adoption such as big data in retailing help in understanding customer attitude, engagement, attributes, and preferences. It also helps in need recognition and allows the firm to provide quality services or products to the customers so that their needs are fulfilled adequately.

Role of Business Analytics in Retailing

According to Ahmed et al. (2015) business analytics is the process of gathering, categorizing, handing out, and evaluating the information sets so that relevant insights could be gained about customers, businesses, and commercial processes. It combines different organizational aspects such as management, technology, and commercial attributes. Business analytics bridges the gap between technology and administration by providing an understanding of data and statistics. It develops communication channels and enhances the problem-solving attitude of business managers. It makes use of different technologies such as big data, data visualization, predictive analytics, and statistical evaluations to acquire information about a customer that is beneficial for the business.

Intel, "Center (2014) examined that other techniques such as magnetic, agile, and deep (MAD) assessments and self-tuning applications are also included in the business analytics process so that algorithms are developed to structure the unstructured datasets. Chen et al. (2012) analyzed that with the application of business analytics and big data technology, the business managers become smarter that impact decisions and help to grow and expand firm functionalities. It also helps in developing communications with the customers, addressing their grievances, and providing enriched services.

As a result, Sharma et al., (2014) examined that due to the adoption of business analytics, the firm enhances its capabilities and creates appropriate business outcomes. the application of business analytics in the retail sector helps in carrying out order management processes, inventory management, and creating payment gateways. It also systemizes the supply chain process and enhances customer relationship management attributes of the firm. For example, business analytics is used by mega malls and outlets that assess the mega datasets developed by them based on supplier data, in-store sales data, campaigning data, in-store data, and e-commerce data. Business analytics helps in assessing these databases with the help of customer profile analysis, market analysis, sales analysis, price analysis, and inventory analysis. It helps in gaining a better understanding of the transformational process in which business analytics converts information into knowledge, and knowledge into the value. It facilitates company functionalities and enhances their abilities to serve the customers adequately.

Zikopoulos & Eaton (2011) examined that business analytics is an essential tool that provides relevant information related to customer attitude and purchasing patterns. It allows the retailer to find solutions related to customer behavior and its associations with shopping, expenditure, catalog, costing, and click streaming promotional data. As a result, the retailers to make a smooth transition from the brick and mortar model of retailing to the multi-channel form of retailing. It also allows the retailer to venture into different modes of retailing such as internet retailing and mobile retaining. It helps the retailers to promote the merchandise on a larger platform and increase sales to optimized levels. business analytics tools are used by retail

companies such as Amazon and eBay for smart advertising purposes. Business analytics allows the retail company to keep a track of customer searches and purchases and suggest purchase options based on that acquired information. For example, if a customer is searching for Harry Potter books, he/she will be provided with information related to Harry Potter book retailers along with retailers that are provided books of the same or similar genre. Thus, the customer is influenced to search options of books that may excite him/her and make additional purchases. The Data intelligence tool of business analytics creates personalized interaction with the clients and end-users based on past spending and interests that help in promoting products smartly. For instance, Amazon is using Amazon Go feature to analyze the moves, tastes, or preferences of the customers by using integrated cameras, sensors, load cells, and weight scale to record the entire shopping journey each consumer. It records the data related to time taken by consumers to read or analyze the product, time consumed to select the product or return it to the shelf. Thus, it can be said that the tool helps Amazon to analyze the behavior intelligence of consumers and make appropriate changes in business workings so that sales are increased. Business analytics is beneficial for the retail sector as it helps in price optimization, demand prediction, forecasting trends, identifying customers, and availing return on investments (ROI). While focusing on price optimizing, business analytics develops algorithms that help in tracking demand, competition levels, and inventory status. For example, United States-based Stage Stores uses business analytics to forecast rise and fall in demand and accordingly coordinate the store inventory so that the wastage magnitude is reduced. It helps the retail firm to reduce its cost and enhance sales by making effective use of the rise forecasts. Additionally, data-based predictive risk and intelligence filters are used by the retail firm to gain better learning about customer spending. It helps the firm in coordinating the product promotions accordingly so that there is an optimization of the purchase intentions of the customers. As a result, the retail firm receives high returns in the form of sales against the investments made in the form of technology adoption. The adoption of business analytics also helps to gather information about the customers related to availing of discounts, promotional deals, and offers. It facilitates the firm to make decisions regarding promoting products and services by using discount techniques so that business performance is enhanced to high levels. It will help the firm to create customer loyalty and reduce churn out rates significantly. Thus, it can be said that business analytics is used by businesses to acquire learning about customer behavior and purchasing patterns so that business sales are optimized.

The Theory of Demand-Driven Forecasting in Retailing

Verdouw et al. (2010) examined that the Demand-driven forecasting model in retailing is a complex model that includes several aspects such as sales, supply chain, inventory, environment conditions, and economic indicators. In retailing, demand forecasting is mainly associated with keeping all the stock units afresh to meet the customer demands. It includes adequate forecasting so that the retailer acts accordingly to meet the increasing and decreasing demand for customers. It helps in maintaining in-stock and out-stock by developing associations with suppliers and other dealers. Oracle Retail Demand Forecasting Cloud Service is used by Oracle Retail to prioritize the demand forecasting and save costs up to 35% to 40%. The demand forecasting system provides relevant information based on the 24 x 7 assessment of the customer data, sales data, spending data, and marketing data. As a result, the firm acquires rightful information about customer preferences and engagements and makes business investments

rightfully. Thus, it can be said that the demand-driven forecasting model is beneficial for the retail industry as it helps in reducing costs and optimizing profits.

Impact of Big Data and Business Analytics in Retailing

Akter & Wamba, (2016) examined that Big data and business analytics are advanced technologies that help the retail sector firms to provide personalized customer experience by predicting their preferences and choices. Big data provides relevant customer information by analyzing the past purchasing statics, browsing behavior, and credit card transactions. It helps in acquiring relevant consumer information and forecasting customer spending. For example, big data and business analytics provide merchandise suggestions based on past customer purchases to Amazon which helped it to enhance sales of the company by 29%. On the other hand, Costco, a California based company uses big data and business analytics to provide health information to customers and keep them healthy. Additionally, brands such as Walgreens and Pantene have collaborated with weather forecasting channels to acquire relevant information about weather forecasts. It helps the companies to promote their products to the consumers as per weather alteration. As a result, Walgreens recorded an increase of 4% in sales in the hair care segment and Pantene recorded an increase of 10% of sales in two months.

Opportunities, Challenges and Future Perspectives of Big Data in Retailing

Sridhar & Dharmaji (2013) examined that Big data and business analytics includes predictive analytics tools that help in analyzing customer behavior. It also provides different communication channels such as social media platforms, electronic-trade, and in-store interaction through which information related to consumer purchase behavior is collected effectively. It also helps in monitoring of consumer traffic and predicting sales based on past customer browsing and purchase history. However, the firms may face budget constraints to provide enhanced services to customers at high technology costs. The retail firm that is working as a small and medium enterprise (SME) finds it difficult to leverage the strength and address the weakness of the firm (lack of skilled labor). As a result, the firm does not recognize that the consumer might be using a loyalty program to remain connected to the firm. Additionally, it becomes difficult for the retail firm to provide personalized merchandise suggestions to each customer based on the assessment of customer data and purchase history. It creates a gap between the return on investments as the firm is not able to extract full profit against the investments made on technology and skill adoption.

FINDINGS AND DISCUSSION

As per the above-discussed facts, it can be said that big data and business analytics are advanced technologies that help in predicting future performance, price; optimizing, and forecasting demand. The technologies also help in predicting trends and identifying target customers. As a result, the firms that are operating in the retail sector can provide appropriate discounts, offer the right prices, and reduce the churn rate. It also helps in enhancing product sell rate, enhancing marketing, enriching customer experience, and predicting customer traffic Thus, the study examined that big data and business analytics are highly beneficial for the firm as it helps in reducing cost and increasing the sales of the company. It was also found that

implementing big data and business analytics do not ensure high earning of the firm. It is because the firm might experience issues related to budget constraints, technology compliance, and employee abilities in providing enriched services to the customers. The study also examined that the application of big data and business analytics enhances the involvement of the customers and their interaction with the retailers during the retailing process. It helps in bridging the gap and establishing a good connection with customers. It provides a better understanding related to the transformation of information, increasing the value of products, and customer services.

CONCLUSION

As per the above-discussed facts, it can be said that big data and business analytics are essential technologies that are highly used by the firm in the retail sector to capture customer experience, forecast sales, and provide normative decision suggestions. The application of big data and business analytics also helps in price optimization, demand prediction, forecasting trends, identifying customers, and availing return on investments (ROI). The study examined that big data and business analytics provide different communication channels such as social media platforms, electronic-trade, and in-store interaction through which information related to consumer purchase behavior is collected effectively. Thus, it was concluded from the study that by making effective use of big data and data analytics the retail firm can receive high returns in the form of sales against the investments made in the form of technology adoption. It was also found that the retail firm may face certain challenges such as budget constraints and difficulty in meeting customer expectation but the adoption of technology will provide growth and success to the firm.

REFERENCES

- Ahmed, F.D., Jaber, A.N., Majid, M.B.A., & Ahmad, M.S. (2015, August). Agent-based big data analytics in retailing: a case study. In *2015 4th International Conference on Software Engineering and Computer Systems (ICSECS)* (pp. 67-72).
- Akter, S., & Wamba, S.F. (2016). Big data analytics in E-commerce: a systematic review and agenda for future research. *Electronic Markets*, 26(2), 173-194.
- Chen, H., Chiang, R.H., & Storey, V.C. (2012). Business intelligence and analytics: From big data to big impact. *MIS quarterly*, 1165-1188.
- Davenport, T. (2014). *Big data at work: dispelling the myths, uncovering the opportunities*. Harvard Business Review Press.
- Dhillon, G., & Backhouse, J. (1996). Risks in the use of information technology within organizations. *International Journal of Information Management*, 16(1), 65-74.
- El-Santawy, M.F., Ahmed, A.N., & El-Dean, R.A.Z. (2012). Chaotic differential evolution optimization. *Computing and Information System Journal*, 16(2), 1-4.
- Farbey, B., Land, F., & Targett, D. (1999). The moving staircase-Problems of appraisal and evaluation in a turbulent environment. *Information Technology & People*, 12(3), 238-252.
- Gregor, S., Martin, M., Fernandez, W., Stern, S., & Vitale, M. (2006). The transformational dimension in the realization of business value from information technology. *The Journal of Strategic Information Systems*, 15(3), 249-270.
- Groves, P., Kayyali, B., Knott, D., & Kuiken, S.V. (2016). The big data revolution in healthcare: Accelerating value and innovation.
- Insalaca, A. (2018). Retail technologies & comporment d'acquisto impulsive
- Porter, M.E., & Heppelmann, J.E. (2015). How smart, connected products are transforming companies. *Harvard Business Review*, 93(10), 53-71.

- Puccinelli, N.M., Goodstein, R.C., Grewal, D., Price, R., Raghubir, P., & Stewart, D. (2009). Customer experience management in retailing: understanding the buying process. *Journal of retailing*, 85(1), 15-30.
- Raguseo, E. (2018). Big data technologies: An empirical investigation on their adoption, benefits, and risks for companies. *International Journal of Information Management*, 38(1), 187-195.
- Shankar, V. (2019). Big Data and Analytics in Retailing. *NIM Marketing Intelligence Review*, 11(1), 36-40.
- Sharma, R., Mithas, S., & Kankanhalli, A. (2014). Transforming decision-making processes: a research agenda for understanding the impact of business analytics on organizations.
- Sridhar, P., & Dharmaji, N. (2013). A comparative study on how big data is scaling business intelligence and analytics. *Int. J. Enhanced Res. Sci. Technol. Eng*, 2(8), 87-96.
- Verdouw, C.N., Beulens, A.J.M., Trienekens, J.H., & Wolfert, J. (2010). Process modeling in demand-driven supply chains: A reference model for the fruit industry. *Computers and electronics in agriculture*, 73(2), 174-187.
- Willcocks, L., & Graeser, V. (2001). *Delivering IT and E-business Value*. Butterworth-Heinemann, Boston, MA
- Zikopoulos, P., & Eaton, C. (2011). *Understanding big data: Analytics for enterprise-class Hadoop and streaming data*. McGraw-Hill Osborne Media.