ALGORITHMIC RETAILING – IMPLICATIONS OF AI AND MACHINE LEARNING IN RETAILING WORLD

Abstract

Algorithmic retailing is mess terminology for the normal retailers, but the electronic commerce retailers already having the experience of technology-based retailing seek it as a notorious opportunity to equip their level of operations with due diligence. The advent of technology and the diffusion of the same in the retailing world will be evidenced through a lot more opportunities to engrave the retailing operations beneficial to retailers and customers. This study is an attempt to explore the implications of Artificial intelligence and machine learning algorithms in the retailing world through the cosmetic term called "Algorithmic Retailing". The extent of changes effected by these technologies in the retailing operations, the changing paradigm of the functionality of retailing, the benefits of applying the technologies in leveraging the retailing transactions and delivering the immerse experience to the consumer, and the challenges ahead therein. It is concluded that the continuous seamless involvement of technology will raise the retailing industry to a higher standardized performing industry, with an alarm of careful screening of diffusion on technology.

Keywords: Algorithmic Retailing, Artificial Intelligence, Deep Learning, Machine Learning, Retailing

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I. INTRODUCTION TO THE STUDY

Ever evolving consumer base demands the retailing industry to equip itself and transform rapidly, robustly, and dynamically with vibrant technology advancements. Algorithmic retailing is a form of transformation happening in the retail world in terms of all its activities starting from merchandise management to customer retention. Algorithmic retailing is leveraging the functions of the retailing industry in a never imaginable way. The diffusion of technology is developing the algorithm for every activity of retailing to the pre-programmed decision unit. The merchandise management is efficiently handled by evaluating the historical data of the consumer after due considering the trend and cultural changes happening in the environment. Irrespective of the field, in all ways the technology has taken the complete benefits of automizing the retailing operations. It improves the time efficiency, cost efficiency, and consumer efficiency as a whole the complete efficiency of retailing.

II. BACKGROUND OF THE STUDY

It is a fact becomes the data and processed information will be made available to handle critical scenarios to hope up with an appropriate decision. The data world is emerging as a database, data warehouse, data mining, and data mart, now with the voluminous data storage as Big Data. In retailing, every transaction fires at the front as well as the back end conveying data. If this data is not used properly to evaluate and execute in the dynamic present environment, then the accumulation of data is of no use. The big data alone cannot perform anything; it needs to be aligned with any other technology like Artificial intelligence, machine learning algorithms both supervised and unsupervised, neuro networks, predictive analytics, if-then-else, what-if analytics, and so on to equip the data to contribute towards the future success. These technologies have used the historical and present data observed in the retailing industry to perform the task concurrent to the present situation based on certain constraints and used to predict well-in-advance the demand level, seasonal variation and consumer focus, trend changes, and behavioral variations. The volumed unstructured big data needs to be channelized properly into useful information at appropriate time, the grant opportunity in long term perspective was readily available through the Dynamic Algorithms. To have a deep insight into the database and its pattern of association between the unsolicited data under the retail scenario, the employment of algorithm is inevitable and it is evidenced through the application of AI and ML to attain competitive advantage in the retail world.

The extensive use of Artificial intelligence and Machine learning programming in the world of big data through application of machines in order to acquire the hidden capabilities and cognitive abilities of human being exclusively through Natural Language Processing, Image and Pattern Recognition and matching, and also developing the ability to hypothesize the futuristic learning based on the past experience as rightly pointed out by Rajashree, Global Head of Retail Strategic Initiatives, Tata Consultancy Services.

III. STATEMENT OF THE PROBLEM

Transformation is permanent, change is everywhere present, and retailing is not an exception to that. The retailing industry undergoes different phases of its evolution over some time due to multiple factors and influences, but now the credit goes to the technology diffusion under the digital era. This change and transformation are always a credible and

positive move in retailing which is solicited by both the retailers and consumers. The technology leverages the functions, duties, and contingencies of retailing and assists the stakeholders of retailing to experience a higher-end quality of life in the retailing industry. Now, it is the need of -the the-day, to study the practical implications of technology diffusion in retailing amidst huge investment in technology. This study is an attempt to underline the graceful applications of technology and its drawbacks hitherto.

IV. RESEARCH QUESTIONS

The retailing industry is considered to be the ever-green industry in the world. Where even a single consumer is found, there exists retailing. The evolution of retailing is robust and it is witnessed by the technological implications often. The advent of technology such as Artificial intelligence and machine learning algorithms are reframing, and restructuring the modus-operandi of retailing business in the digital era. Now, the question formed here is to what extent the implications of this technology transform the retail industry? To answer this question, the following objectives are developed.

V. RESEARCH OBJECTIVES

The following are the research objectives assumed to execute the study,

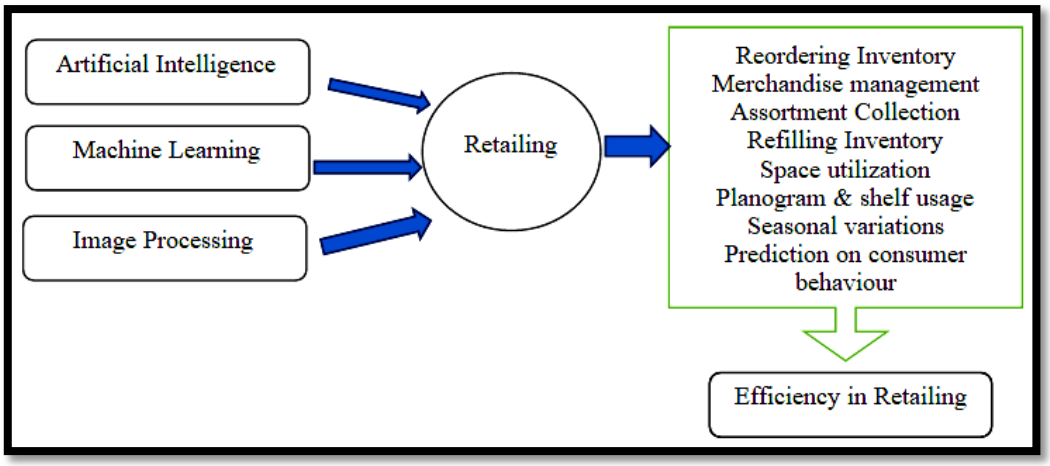
1. To study the implications of Artificial Intelligence and machine learning technology in Retailing
2. To understand the reengineering areas of retailing
3. To evaluate the benefits and challenges of algorithmic retailing

VI. RESEARCH BOUNDARIES

This research is focused only on retailing industry and the changes effected by Artificial intelligence and machine learning technology in the retailing industry. The research narrates the benefits and uses of the implication of these advent technologies and the challenges ahead therein.

VII. RESEARCH FRAMEWORK

The study implies the conceptual framework of explaining the extensive implications of AI and ML in retailing and the same was depicted in the following flow chart,



VIII. RESEARCH SCOPE

This study is evaluating the implications of AL and ML in the retailing world. It attempts to portray the extent of application of AI and ML algorithm exactly discharging various retailing functions like assortment collection, arrangement of planograms, automatic refilling of merchandise, auto-ordering of inventory, and space matrix in the shelf, predicting consumer behavior, and demand forecasting, etc. This study focuses on the deployment of AI and ML technologies and their benefits and challenges derived thereof.

IX. RESEARCH METHODOLOGY

The research design adopted for this study is the exploratory research design. It is an attempt to explore the invasion of AL and ML technology in the retailing world. It is an upcoming trend in retailing, the advancement in technology leveraging the pressure of retailing industry to a certain extent. The careful analysis and implementation of this advanced technology will solicit a lot of unimaginable changes in the retailing world. Whereas it has the other end as well, the non-compliance of certain procedures and lethargic treatment of technology will injure a lot, driving the company away from the industry. It is exploring only the usage, benefits, and challenges encountered by the retailing companies due to the incumbent effect of Artificial Intelligence and machine learning technology.

X. RESEARCH IMPLICATIONS

Algorithmic retailing is gaining importance very recently with the advent and extensive application of AI and ML in the field of retailing, especially to meet out the growing competition and the dynamic preferences of customers, as quickly as with the robust technology and vibrant competitive potentials. The useage of Algorithmic retailing is ranges from grocery and staple goods to manage the viral and big performing brands in the retail industry.

1. **Inventory management:** to predict the future demand and market fluctuations in the retail industry, predictive analytics was applied. It normally helps the retailers to predict the demand fluctuation, so that they can manage the inventory to the expectations of the

customers. It will also enhance the retailers avoid the stock-out position and guide them to attaining efficient merchandise management.

2. **In-Store allocation:** The pulse of the customers and their footsteps can easily be observed and measured using business intelligence predictive modeling techniques in the retail industry. The big data will help the retailers to seek out the possibilities of extracting knowledge about their customer's behaviors from the hidden pattern unstructured database such as buyers' past buying behavior, preferences and choices, habitual buying actions, and so on.

3. **Store display:** Equip the retailers to plan for their merchandise management and window display arrangements strategically, attract the customers and increase the brand identity and equity by placing the brand at the right choice of the buyers, through algorithmic retailing, they can able to predict the trend like to happen in future accordingly they can organize their retail environment.

4. **Channel optimization:** it is big deal for any detailers to optimize their channel of distribution in order to connect so many dots such as inventory management, merchandise and assortment collection, in-store stock, expected time of delivery to avoid stock out position, integrating of the online activities and including the IoT operations into stores and logistics management, algorithmic retailing is great support.

5. **Price optimization:** The prediction of demand and preference level of customers on the requisite inventory and the ready market availability of the expected inventory at the time are used as the input to measure the price level of the product at the market when the time of delivery. Algorithmic retailing predicts the in-store traffic pattern and explores the futuristic demand of customers of any particular product, based on the price will be optimized.

   In a day, ridiculously 2.5 million-plus price changes effected in retail by Amazon alone; it is an inevitable paradigm shift to leading researchers in the field of electronic commerce and industry specialists and tops have not only referred to it as a trend fair, but commanding market players to spring up their play and proceed the price intelligence to stay ahead of the hectic competition, diluting profit margins, and the scenario of hard-to-convince customers.

6. **Targeted marketing:** Customizing the products and services and designing the promotion campaign to best fit of the target group of customers can be attained when the retailers adopt the algorithms to monitor their regular activities. It helps them to monitor and observe the progress of their customers with respect to real-time recommendations, browsing activity, and search history and it will equip the retailers to send the activity-based recommendations through texts and emails and design and launch the advertisement on social media to cover the uncovered.

7. **Geo-fencing:** It is evidenced that, the customers will collect the messages and tweets whenever they crossed the fencing area of the retail shops within the proximity zone of the retailers, then the retailers can able to send curated messages to the consumer. The offering of promotions, coupons, and other benefits and e-receipts have happened through

the messages that will, in turn, encourage the customers towards the retail shops and induce them indirectly to spend a lot.

Factors which get influenced by algorithmic retailing are,

- Dynamic inventory optimization
- Enhanced space optimization through routing and scheduling algorithm
- Planogram compliance
- Automating store tasks
- Gap scanning on Shelf
- Selecting the optimal route for picking
- Anomalies Detection to manage the customer journeys in the omnichannel platform
- Contextual customization
- Enhancing the last mile delivery and visibility to fulfill the customer promise, and
- Customer flow path optimization

XI. CHALLENGES OF ALGORITHMIC RETAILING

Amidst all the transformations registered in the retail industry, it needs to reconsider a lot of sensitive platforms where the retailing needs to have surveillance over it. The problematic area identified when diffusing the technology in the retail world are,

1. Difference in the instore illumination capacity,
2. Patterns of product packaging,
3. styles and surface,
4. diversified packaging units,
5. shelves management through articulating the product,
6. optimum utilization of in-store spaces;
7. differential camera resolutions and
8. Capacity of store associates, and so on.

It is witnessing a real-time scenario that, often two sellers on Amazon selling the same kind of merchandise compete with each other by changing the price. They use an algorithm that works on relative pricing concerning opponent and demand. Due to the uniqueness of this algorithm working nonstop for the retailer, the price of a commodity changes not just once in a day, but many times based on demand. At one point in time, it was noticed that in 2011 that one of the biology books with an MRP of $20 was being sold on Amazon at a humongous price of 23 million dollars, unimaginable, this is the problem of the algorithm. Perhaps, it is no matter the efficiency of technology, there are always some glitches during the starting stage. The amicable way to go ahead with the algorithm in the retail world is to have a dedicated audit and scrutiny team to ensure the quality technology is diffuse.

XII. BENEFITS OF ALGORITHMIC RETAILING

The following are the benefits of algorithmic retailed as mentioned by several researchers,

1. **Scale:** All business units can share data, build AI applications, and cross-leverage outputs through a common foundation using Algorithmic retailing.

2. **Value:** Value addition in terms of increased ROI, Cross-functional collaboration, operational efficiency, cost savings, and control is assured through the algorithmic retailing platform.

3. **Speed:** the efficacy and speed in delivery and operations can be vitalized through algorithmic retailing. Lot many expectations and experimentations are likely to be affected when multiple options are clubbed together and offered through a common platform.

4. **Collaboration:** Integrating and collaborating the different phases of work through the common streamline will produce a positive effect to attain the organizational goal in terms of efficiency and profitability.

5. **Efficiency and cost savings:** The redundancy and delicacy of performing the same task multiple times were strictly monitored and controlled through single streamlined operations and it can be achieved through algorithmic retailing.

XIII. CONCLUSION

Encompassed Technologies with the existing data and algorithms like AI and ML, IoT, and Blockchain will transform every single aspect of the business. But it is evidenced that the real transformation in retailing will be recorded only when algorithmic retailing is applied beyond the scope of personalization and customer service, and evolves into other core areas like logistics and supply chain, merchandising management, In-store operations. In the retailing industry, the technology is diffused in such a way as demand forecasting through predictive analytics, customer segmentation through unsupervised learning, decision support through reinforcement learning, and image and speech recognition through deep learning technologies in the retail world, it will give immerse experience to the retailers as well as consumers. This trend clearly shows that algorithm retailing will keep on influencing the market in the future and the dynamically evolving retail market will also have positive effects on the changing economic scenario as both the retailers and the customers become wiser with their elegant choices.

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