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Chapter

Understanding the Artificial Intelligence Implementation for Allocating an Order to a Seller among Multiple Sellers Who Sell the Same Product

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Abstract

E-commerce sectors are growing rapidly worldwide and it adopts the new technological innovation drastically, such as embracing artificial intelligence in e-commerce sectors. Machine learning adaptation in e-commerce sectors is the most and much news already published by giant e-commerce companies, such as Amazon and eBay. The aim of this paper is to find out how artificial intelligence helps the e-commerce platform to choose a seller from multiple sellers when the same products or listings are sold by multiple sellers. When a customer will place the order, then who will get the order of the customer as multiple sellers sell the item within the same product listings. In the research, it is figured out that machine learning techniques are normally used for the selection of the seller where the prior points used for finding the appropriate seller are feedback or ratings, seller products location or distance from the customer, advertising or PPC or campaign, discounts, etc.

Keywords: e-commerce, artificial intelligence, machine learning, order management, multiple sellers

1. Introduction

The e-commerce sector is growing drastically every day due to the customer's trust and easiness of the products ordering process. It can be said that e-commerce is one of the most identical evolutions of the twenty-first century and in COVID-19 situations worldwide [1]; its value or worth cannot be written in a sentence, which means the e-commerce sector's priority goes up dramatically. Many small businesses and large businesses use e-commerce platforms to operate their business and get sales from the platform. However, most of the people or companies who run or operate their business on large platforms, such as Amazon, eBay, and Google shopping, actually do not know how they actually get the sales from them.

How to get a sale from an e-commerce platform? Many people or companies have these questions normally in their minds. Then the methodologies that are popular nowadays are that one should use digital marketing or SEO or advertisements [2]. Many people or companies invest a lot of money into the marketing purpose to get sales on an e-commerce platform. If one uses their own e-commerce platform, then it is okay to invest a lot of money on sales and marketing purposes, as well as getting popularity of their own e-commerce platform; however, in the 1st world countries, most companies or people are moving to the giant e-commerce platform, such as the Amazon, eBay, Alibaba, Rakuten, and Google shopping, because they know that they can get orders from their platform if normally they list or create their stores on these giant platforms. How can one seller or a company or person get sales from a popular platform? This is one of the big questions nowadays.

One should say that these giant platforms invested a lot of money for building their popularity or getting attractions to the customers. Not only did they invest money in advertisements but also in the adaption of new technologies and methods for implementation in their platform. Artificial intelligence is one of the prime technologies that are being adopted in e-commerce by which many tasks are very light and can be used for prediction, forecasting, and allocation purposes [3]. Customer behavior to the platform and trusted customers or defaulted customers can be sorted out through the implementation of artificial intelligence [4]. How the products can be cycled and how the product's assortment helped in selling an item in e-commerce can be pointed out through artificial intelligence [5].

Nevertheless, it should be stated that artificial intelligence applications, such as machine learning, data mining, deep learning, and recommendations algorithms, are vastly used by a lot of giant e-commerce platform owners and they keep updating themselves with the use of these techniques [6]. The recommendation algorithms are very popular and are used by a lot of sectors or industries, such as Netflix, Amazon, eBay, and Google [7]. Recent news comes from Amazon is that they reduced packaging waste by the use of machine learning [8], so it can be noted that giant platforms keep updating themselves with the use of AI. In this paper, the key technologies that surround how one should understand that they can get sales from an e-commerce platform where multiple sellers sell the same product. Though it cannot be stated that every platform uses the same key technologies that are stated in this paper, however, sellers or companies will gain vast knowledge after reading the paper (**Figure 1**).
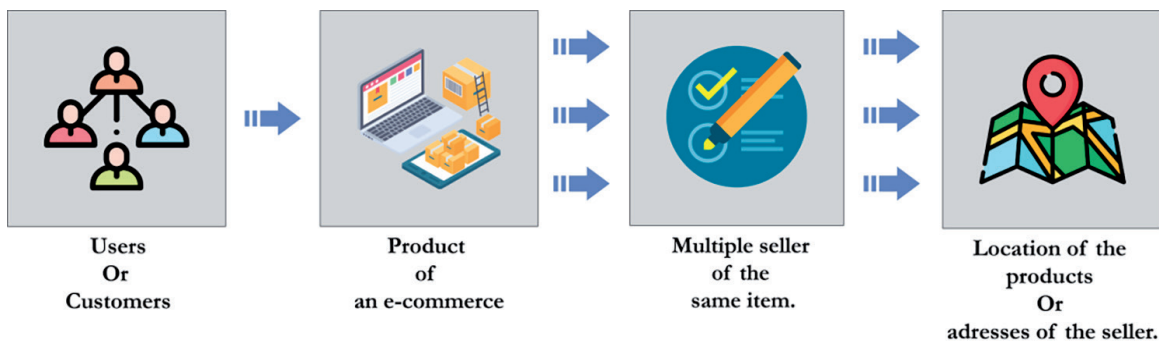

Figure 1.
E-commerce ordering procedure for a product where multiple sellers sell the same product.

2. Background

E-commerce sectors are growing rapidly, and in most cases, people are most likely to build B2C e-commerce sites. However, there are few e-commerce sectors that provide multiple sellers opt for specific products or brands. Some of the e-commerce platforms both served as B2C, B2B, and in all e-commerce sectors that provide an option for companies or stores to list their items on their platform are normally called C2B but have the option of B2C and B2B as well. The seller who is selling the items on the e-commerce must need to know how to use their platform and how to add images or products. In many cases, sellers are worried about the sales and want to generate sales by using advertising or campaign techniques. Without implementing or investing in marketing for the products, some sellers can easily get sales as well. This paper focuses on how sales can be generated from e-commerce by the e-commerce built-in methods or implementation of AI or machine learning methods.

Research carried out shows that it depends on the customer's rating and feedback [9]; however, many researchers find out the products need to be attractive [10] or products' popularity can be an eminence that can play a good role in the sales of a product. Product choices for selling purposes on e-commerce are similar, like before starting any company, one should think and survey the market and how the people are willing to absorb the new products and the similar product's current market worth or value [11]. People or companies need to know a basic understanding of how the platforms normally work and how the technology helps run an e-commerce platform to be more identical so that marketing costs will be less.

It can be stated that without any investment in the advertisement, one seller can get sales from a platform such as Amazon, eBay, and Etsy. Actually, no one knows how it will work, however, the key technology behind it is the recommendation algorithm, whenever a similar type of product will be searched on the platform, if the seller item is cheap and have a good reputation, then it will show on the search [12]. However, there are some other criteria that are on the air for getting better search activities, such as elaborative descriptions, features, good zoom quality images, correct product type selection, and informative keywords. A group of researchers already worked on the features finding as it plays a vital role in the sales of products and comes up whenever a product search occurs [13]. It seems that for the betterment of the products, looks, and sales, the above criteria are necessary.

We are living in a Era where we cannot think of a single moment without the help of artificial intelligence, rather day by day more implementations are adopted to our regular life as AI shortens the tasks and helps us improve our tasks. Data science and machine learning are currently widely implemented in e-commerce sectors for sales and attracting customers [14]. The machine learning approach is used for fraud detection in e-commerce sectors as well [15]. The machine learning support vector machine used on the product reviews helps people's choices or attraction or sentiment analysis [16]; in some cases, machine learning is used to predict sales of a specific store's products [17]. Knowledge-based means using data mining techniques and machine learning the recommendation system actually work as well [18]. At last, it can be said that every aspect of the e-commerce sector is updating rapidly with the use of artificial intelligence, machine learning, recommended systems, data mining, etc.

3. Observation

In this research, the identical observation has made through the use of a renowned e-commerce platform and the main observation was about the multiple sellers who are selling the same item. Example: Let us say, a product is a sunglass, which is from the company Ray-Ban, and that item can be sold by different sellers as the manufacturer authorizes those sellers to sell the same product on their floor and online. So if all the sellers want to sell this item on online platforms, such as Amazon and eBay, then they have to use the manufacturer-provided specific UPC. By using the same UPC, different types of issues can arise and it is found in a research paper [19]. As the same product can be sold by multiple sellers, then questions can be arising to the seller who will get the order when a customer will place an order. The shortest path algorithm to find the nearest product location from the customer can be a good solution that can be stated for selling purposes [20]. However, the background of the technologies is still hidden as everyone knows that e-commerce sectors are adopting new technologies and artificial intelligence vastly, so how the order procedure beyond one product with multiple sellers works is still hidden. In this research, the basic ideas with the proper example will be given step by step to figure out the key technologies or the techniques that are involved in getting an order for a seller.

4. Research gap

The main research gap for this research, which is conducted, is finding how the large vendor manipulates the orders whenever a list of sellers sells the same item. It can be very good for the seller who wants to sell in large vendors, such as Amazon [21], Ebay, and Google shopping. Because if they can understand the technology behind how they can get the orders from the large vendor as they seem that it is very competitive. However, if they want to sell only their products, then they can judge whoever will buy their products, how much sales they can generate from the e-commerce platform, and they need to do research based on similar products, but it can be very useful for the retailers. If one seller sees that a product is sold by 40 different sellers, they normally will lose hope to sell that item and that can be a negative effect on the e-commerce sector. However, when they will find out that the main technology behind the selling procedures is artificial intelligence where each of the sellers will get a minimum order, then they will definitely move to the large platform for selling their products.

5. Experimental procedure

After years of observation of the e-commerce sectors, it is very identical that a product can be sold by different sellers or companies. Like a shoe of the UGG brand can be sold by multiple sellers on an e-commerce platform like Amazon, where each seller is different as they listed the item with the same UPC (Universal Product Code). So, let us say a seller sells a shoe whose size is 8, and the same shoe size has 6 different sellers, then sellers seem to be worried about from whom the customer will buy. It is true that one customer can choose from a list of sellers; however, in research, it is figured most cases customers do not choose sellers (**Figure 2**).

The experiment was done using the largest e-commerce platform Amazon [21] and multiple orders have been tried from different locations in the USA to figure out
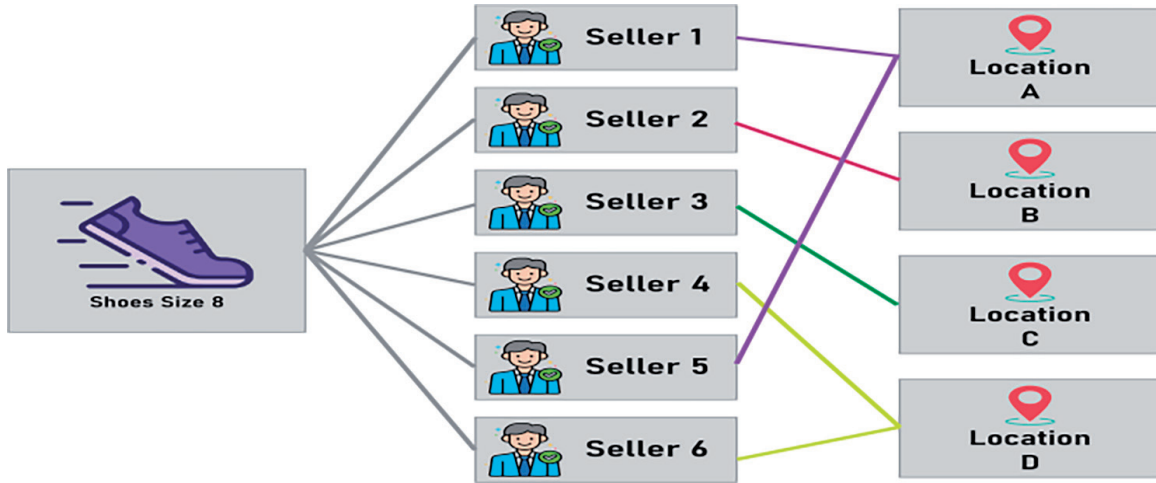
Figure 2.
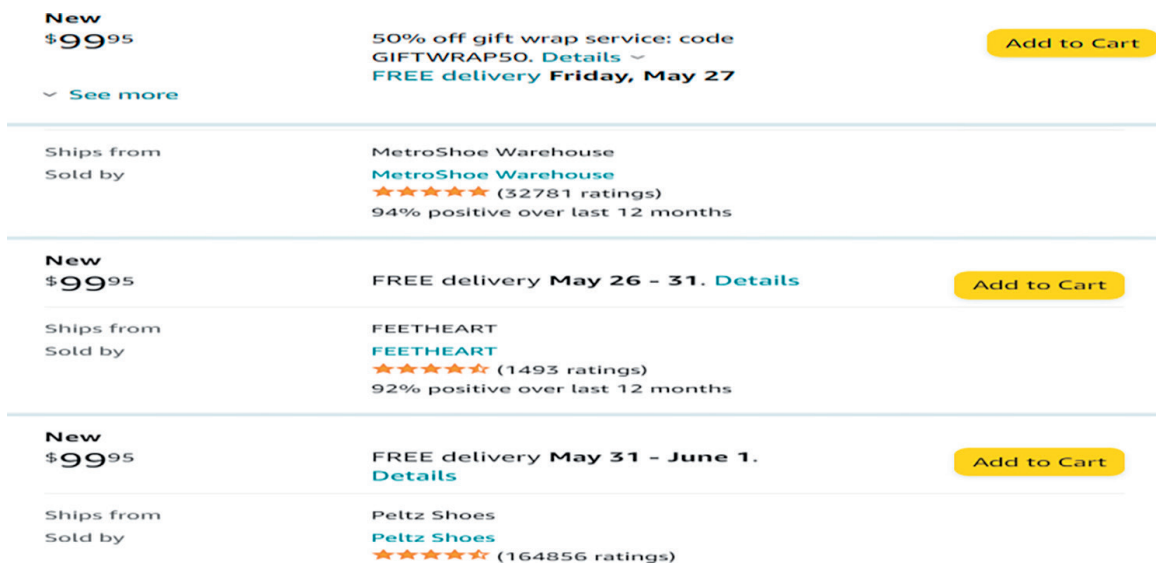*Multiple sellers of the same product and seller's location.*

Figure 3.
Twenty-seven sellers sell the same products and some of them are captured in the figure.

which vendor is chosen whenever a customer from different states orders a product of UGG [22]. If one visits the product, then it will be found that around 20 plus seller sells the same product. In **Figure 3**, the images of the sellers are enlisted.

6. Data collection

6.1 Consumers data

In this research, feedback from 97 customers has been taken, where 75% of customers told that they do not choose the sellers, whereas 25% told that they sometimes but not always check the seller's name. A total of 25% of the customers also suggested that it is better to check the seller's overall scores, feedback, etc., so that they can normally think about the defect rate of the products or wrong shipment issues. Customers always look for prestigious sellers who are for a long time so that people have faith in them.

6.2 Sellers data

Around 40 sellers participated in this research, where they have been asked some questions, such as how they feel that they will get a chance to sell their products as multiple sellers sell the same item. Most of them replied that this is an uncertain thing, however, they always try to maintain their store's page attractively, and if they get any negative or bad reviews, they always satisfy the customer's issues. In many cases, they do refund and offer an exchange for the products for maintaining their good selling ratio.

In the questionnaire, it has been asked what they normally do for getting sales for their items. Twenty-nine of them replied that they normally do advertisements, campaigns, PPC (pay per click), discounts, etc. But in many cases, as the manufacturer bound them not to put discounts, then they cannot do it. Ten sellers told that they do nothing but they are getting orders. However, it is noted that those sellers who are doing advertisements, campaigns, PPC, etc., have better sales than the other sellers. So the question in mind is that how does the seller who does not do anything get sales as well?

7. Understanding the process of order distribution

It is figured out on the questionnaire that each seller can get sales from a platform whether they have good feedback (customer ratings) or no feedback (no customer ratings). However, if bad feedback (customer ratings) any seller has, then it will lower their chance of getting an order on an e-commerce platform.

7.1 Multiple sellers with good feedback

The key technologies of getting an order for the seller are normally evaluated by the system's hidden calculations that normally occur by artificial intelligence. Suppose that in machine learning we normally train the dataset that we have, then the algorithm predicts the results. So if we think of five sellers who have good ratings or feedback and sell the same item, then an algorithm can help allocate the customer's orders for them. If we draw with a diagram, then it can be easily understandable. Let us say, we have sellers 1, 2, 3, 4, and 5, where each of them has the ratings or feedback as follows:

- Seller 1 = 450 ratings

- Seller 2 = 200 ratings

- Seller 3 = 1010 ratings

- Seller 4 = 590 ratings

- Seller 5 = 900 ratings

So, if we train the dataset on a machine learning algorithm, then it can easily predict that seller 3 has the best rating, so the order should go to seller 3. However, a good system checks more basic points, such as the distance or location of the sellers as the

buyer or consumers will always prefer the seller with less distance. So that the dataset-based distance algorithm can be an ideal technique for selecting a seller for the order [20]. Let us say that the five sellers have the distance from the customer as follows:

- Seller 1 = 300 km

- Seller 2 = 400 km

- Seller 3 = 1200 km

- Seller 4 = 350 km

- Seller 5 = 500 km

Now the system will calculate differently as the distance is another factor so that the system will allocate the nearest seller with average good ratings. So, in this case, the system will choose seller 4, though seller 1 has the lowest distance, however, seller 4 has a better rating than seller 1. So, the artificial intelligence applications help a seller for getting an order (**Figure 4**).

However, exceptions can be there if sellers use the system campaign or advertisements. Like seller 4 does not use the campaign, however, if seller 1 uses the campaign of the e-commerce platform, then the seller will be awarded for the order as the platform owner will get an amount of money for the order as the sellers are willing to pay for the pay per click (PPC) option (**Figure 5**).

7.2 Multiple sellers with no feedback

When an item has multiple sellers but none of the sellers owns any feedback or ratings, then the system will just check the distance from the customer to the seller for
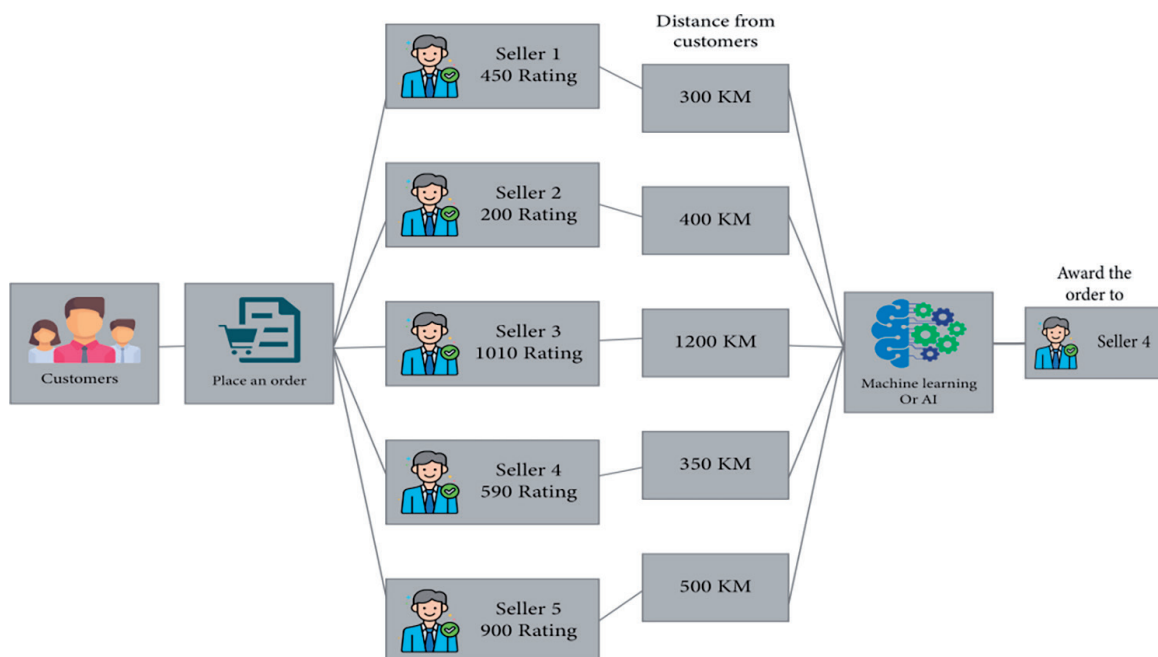

Figure 4.
How machine learning and artificial intelligence allocate an order among the sellers.
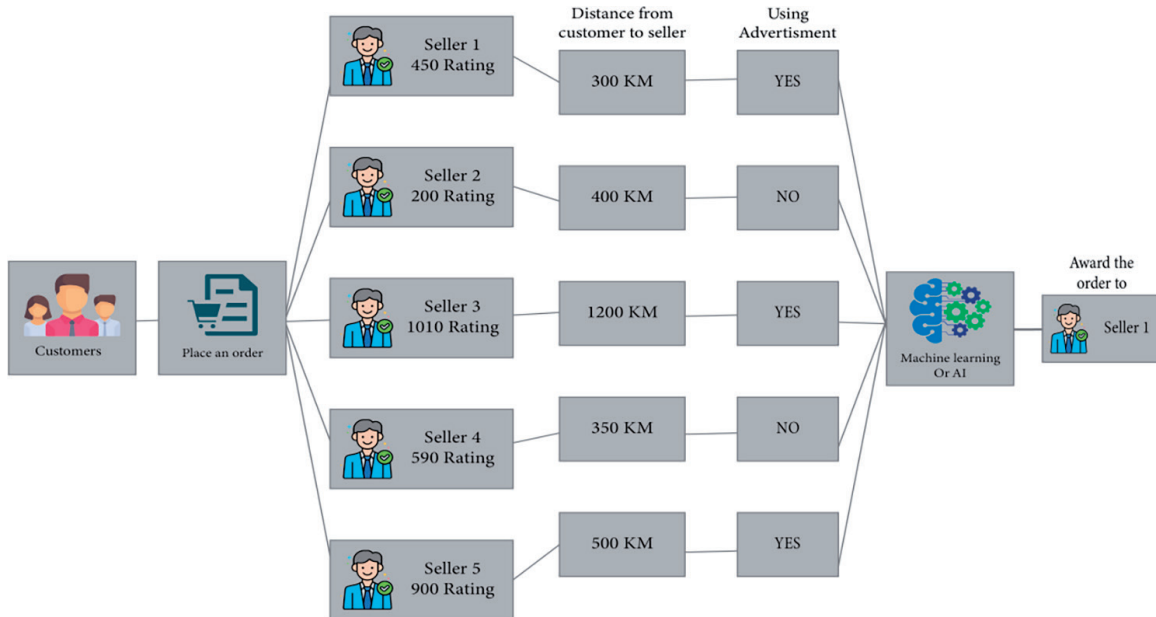
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Figure 5.
How machine learning and artificial intelligence allocate an order among the sellers when the seller uses.

allocating an order to the seller. Let us say seller 1, seller 2, and seller 3 do not get any feedback yet, and then the system or application will check the distance as follows:

- Seller 1: No feedback: Distance from customers 400 km

- Seller 2: No feedback: Distance from customers 300 km

- Seller 3: No feedback: Distance from customers 500 km

Then the system will automatically select seller 2 for getting the order as the customer address are the nearest distance from the seller. However, if any of the sellers use the advertising, then their possibilities of getting the order will be more appropriate.

7.3 Multiple sellers with both feedback and no feedback

Whenever a product has sellers with both feedback and no feedback, then the system chose from both depending upon the distance, ratings, and advertisement purposes. Let us think of a product with six different sellers in which two sellers do not have any feedback or ratings and four of them have feedback or ratings. Three of them use the advertisement for their items to be sold, which are given in the chart below:

From **Table 1**, it can be easily identified that seller 5 has the lowest distance for the customer, however, it has no feedback, and seller 5 does not use any advertisement. It can be also identified that sellers 4 and 6 have the 2nd lowest distance, which is 300 km, however, seller 6 does not have any feedback but seller 4 has good ratings or feedback. There is one noticeable thing, both seller 4 and seller 6 use the advertising of the products, so both can win the chance to get an order. Depending on this case, the algorithm or technique will easily select seller 4 as it has both feedback and uses advertisement. But it cannot be said that it will not choose seller 6 for any order. There can be conditions like if the same approach occurs multiple times, then select seller 6 one time if the same thing happened 10 times. Otherwise, if the seller with no rating

Seller no.	Gained ratings	Distance from customer	Using advertisement?
1	500	800	Yes
2	600	450	No
3	300	550	No
4	800	300	Yes
5	0	200	No
6	0	300	Yes

Table 1.
Dataset format when product sellers have both feedback and no feedback.

doesn't get any orders on the platform, so it will lead the seller to lose hope to sell the item on the e-commerce platform.

7.4 Exception cases

There can be a lot of cases as an exception, which means the system described here cannot be potential for it because how the algorithm the developers will use in their policies. One of the identical exceptions is providing discounts on the products to get the attention of the customers, and customers always prefer to get discounts and willing to buy good products with discounts. The sellers who are giving discounts on their products will definitely get the priority of selling; however, in many cases, the manufacturer or the owner of the brand bounds the seller not to provide discounts. But in many cases, it is observed that many sellers do not follow the rules. So, this case can be an exception for getting an order. In some cases, it is observed that still in some orders, the seller does not get a discount because of their interruption and product availabilities. Like the discount exception, if a seller has items like 10pcs and another seller has 2pcs of the same product then, if the customer does not look properly at the discounted items then it will automatically be awarded to the seller with fewer quantities.

8. Discussion

The technology is beyond our knowledge of any e-commerce site where each platform owner implements their own technology. The popular technologies that are used to minimize the tasks of an e-commerce site are normally machine learning, data mining, data science, deep learning, and methods [23]. Research is already going on the theoretical understanding of products embedded in e-commerce by which researchers are trying to figure out how the machine learning techniques can be utilized properly in e-commerce [24]. This paper tries to figure out how an order will be distributed to a seller from a list of sellers of the same products.

The procedure and steps shown in this paper are normally investigated on an e-commerce site and there was a questionnaire section for both customers and sellers. So, both the seller's and buyer's perspectives on the e-commerce sector can be known. The research tried to figure out the hidden machine learning models that are occupied by the e-commerce sectors if e-commerce provides an option for selling the same product with the same UPC. It finds out the pattern by observing the platform and the questionnaires. The platform is observed for a year for the methodology finding and it

can be stated that the e-commerce platform uses these techniques for selecting a seller whenever an order is placed by the customers.

It is true that there can be always exceptions; however, the e-commerce platform owners never open their ways of working into the air, but in this research, it was tried to figure out the technologies adaption and how the process actually is beyond a platform. In near future, more research will be carried out, and hope to work on the future with the platform owner so that real-time observation can be carried out by practically seeing the background system of any platform.

9. Conclusion

E-commerce uses are rising rapidly during the pandemic, and if a person thinks of business nowadays, then he/she first thinks of setting up an e-commerce platform. There are a lot of e-commerce platforms that already exist and give the option for the seller to list on their platform and in that case they take commissions from the sales. So that a lot of brands' products can have multiple sellers, and under one product page, a list of sellers can sell their inventory. So questions can arise about how the sellers will get an order as many sellers use the same platform. In that case, the research will help them find out how the sales will come or be appointed to the seller from an e-commerce platform. There can be exceptions that are elaborate in this research; however, the main summary has been sorted out that artificial intelligence is vastly used in e-commerce sectors, and choosing a seller from multiple sellers is one of the best examples of understanding the artificial intelligence uses. In the future, the research will focus on doing research physically with any of the renowned platform owners so that background codes and implementation can be understood more politely.

Acknowledgements

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