

# Product Recommendation System for e-commerce Website

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## ABSTRACT

Recommender systems are Nowadays heavily used by some e-commerce websites. It has become a serious business tool. This led to a big change in the world of e-commerce. Many of the most important commerce websites are already using recommender systems to help their customers find products to shop for. A recommender system learns from a customer and recommends products that he/she's visiting find Most worthy from among the available products. during this paper, we present a symbol of how recommender systems help E-commerce sites increase sales, and analyse five sites that use recommender systems including several sites that use over one recommender system. supported the examples, we create a taxonomy of recommender systems, including the interfaces they present to customers, analysing the behaviour of consumers over different products, the technologies used to create the recommendations, and also the inputs they need from customers. We conclude with ideas for fresh applications of recommender systems to E-commerce.

## KEYWORDS

recommender systems, e-commerce, behaviour analysis, interface, customer loyalty, cross-sell, up-sell, mass customization.

## 1. INTRODUCTION

This era of the internet where everything you need is at our fingertips led to a world of e-commerce which further led to great competition in commerce websites.

If we take reference of the book Mass Customization by *Joe Pine (1993)*, where he stated that companies must shift from the old world of mass production where “standardized products, homogeneous markets, and long product life with better development cycles are the rules” to the new world where “variety and customization replaces various types of standardized products.” Pine also stated that producing only a product is simply not adequate anymore. Companies must be ready to, at a minimum, develop multiple products that fulfil the multiple needs of multiple customers. The movement toward E-commerce has allowed companies to produce customers with more options. However, in expanding to the present new level of customization, businesses increase the quantity of knowledge that customers must process before they're ready to select which items meet their needs. One solution to the current information overload problem is the use of recommender systems.

Recommender systems are utilized by E-commerce sites to suggest products to their customers. The products are recommended based on the highest overall sellers on a site, supported the demographics of the customer, or supported an analysis of the past bought items to predict future buying. Generally, these methods are a part of personalization on a website, because they assist the location to adapt itself to every customer. Recommender systems automate personalization on the net, enabling individual personalization for every customer. Personalization to the current extent is a way to understand Pine's ideas on the Web. Thus, Pine would probably accept as true with Jeff Bezos, CEO of Amazon.com™, when he said “If I've got 2 million customers on the online, I should have 2 million stores on the Web.”

**Browsers into buyers:** Visitors to an online site often look over the site without ever purchasing

anything. Recommender systems can help customers find products they need to get.

**Cross-sell:** Recommender systems improve cross-sell by suggesting additional products for the customer to get. If the recommendations are good, the typical order size should increase. For example, a website might recommend some additional products related to a product in the cart within the checkout process, supporting those products already in the handcart.

**Loyalty:** By taking reference to the quote **“In the world of internet customer service, it’s important to remember your competitor is only one mouse click away”** Doug Warner *(former chairman of the board of J.P.Morgan&Co)*. Recommender systems improve loyalty by creating a value-added relationship between the positioning and therefore the customer. Sites participate in learning about their users and their behaviours, it also analyses the choices users make. Sites Use recommender systems to perform operations on those learnings and present custom interfaces that match customer needs. Customers repay these sites by returning to those that best match their needs. The more a customer uses the advice system – training it what they require – the more loyal they’re to the positioning. Even If a competitor has the same features, a customer would have to spend an excessive amount of time and energy teaching the competitor what the company already knows. Finally, creating relationships between customers can even increase loyalty. Customers will return to the location that recommends people with whom they’re going to prefer to interact.

## 2. RECOMMENDER SYSTEMS EXAMPLES

In this section below we are going to visit about four recently active e-commerce websites that use one or more variations in the recommender system technology in their websites. For every site and every variation, we provide a brief description of the features of the system. In later sections, we confer with these examples as we explain the kinds of recommendations provided, the kind of technology used, and the types of information gathered. For organizational purposes, these sites are alphabetized. because of the rapid changes within the Internet, they may now not be valid.

### 2.1 Amazon.com

We concentrate on recommender systems within the book section of Amazon.com.

**Customers who Bought:** Biggies such as amazon (www.amazon.com), has a feature that their every page has structured information about each product. For every product customer views, the site shows the products other customers also buys.

For example. If a customer buys a phone and case for its phone protection then this information is seen on the products page that customers also like to buy.

**Eyes:** it is the feature that allows customers to be notified via email of recent items added to the Amazon.com catalogue. Customers enter requests based upon the subject, title, author, ISBN, or publication date information. Customers can use both simple moreover and more complex Boolean-based criteria i.e. (AND/OR) for notification queries. Requests are additionally directly entered from any search results screen, creating a persistent request that supported the search.

**Ratings:** This feature allows users to give ratings to the products as well as see the ratings of previous customers who had to buy that product. This leads to analysing the behaviour of the customers over the products and category of product. Ratings are rated from 1-5.

**Customer comments:** Customers can give comments to a product or read the comments from previous users and using NLP can analyse customer behaviour. This feature led customers to receive text recommendations based on the opinions of other customers.

Also, customers can ask questions about the products as well as answer about the product that they had Bought.

**Amazon.com Delivers:** Amazon.com Delivers could be a variation on the Eyes feature. Customers select checkboxes to settle on from a list of specific categories/genres (Oprah books, biographies, cooking). Periodically the editors at Amazon.com send email announcements to notify subscribers of their latest recommendations within the subscribed categories.

**Book Matcher:** This feature allows customers to give direct feedback about books they need to read. Customers rate books they want to read on a scale of 1 to 5 from “hated” to “loved”, After rating all the samples of related books, customers may request recommendations for books they could like. At that time a half dozen unrated texts were presented which corresponds with the user’s indicated tastes. Feedback to those references is done using the “rate these books” feature where customers can specify a rating for one or more than one recommended book.

## 2.2 Flipkart

Flipkart works mainly as same as most of the other top e-commerce companies such as amazon. Much of their recommendation systems work similarly. For example, if customer types in the search box to find a mobile phone or maybe a smartphone it gets stored in their book with the name of the customer and what he searched for, and what they do is the next time any new phone is launched on their website they send reminders to the customer to purchase it or enroll for the pre-booking.

**FAQ:** Customers can ask questions related to the products and anyone who has previously bought that product or the seller itself can answer. This feature does not only give data but also makes the site more reliable and makes the trust factor stronger among users.

**Email Notification:** This feature keeps track of the user searches, and then notifies the user whenever a similar product comes to the site. For example. If a customer is searching for a mobile phone but did not purchase anything, so after that any new phone launches on the site which meets the requirement of customer previous searches, then the customer will be notified through his/her registered email.

## 2.3 eBay

**Feedback:** The Feedback feature at eBay.com™ (www.ebay.com) permits both buyers and sellers to contribute to feedback profiles of other customers with whom they have done business. The feedback consists of a satisfaction rating as follows (satisfied/neutral/dissatisfied) as well they can write a specific comment about the other customer.

Feedback is used to deliver a recommender system for purchasers, who can view the profile of sellers. This profile consists of a table of the number of each rating in the past days, weeks, past month, and past 6 months, as well as an overall summary (e.g., 981 positives from 677 unique customers). A customer can browse further individual ratings and comments for the sellers upon requests.

## 2.4 Levis

**Style Finder:** This feature in Levi allows customers of the Levi Straus™ (www.levis.com) website to receive recommendations on articles of Levi's clothing. Customers indicate whether or not they are male or female, then customers view 3 given categories that is Music, Looks, Fun -- and based on it they give ratings to a minimum of four "sub-

categories" within each of them. They are doing this by providing a rating on a 7-point scale starting from "leave it" to "love it." they will also choose the rating which is of "no opinion." After fulfilling the given number of ratings customers may select "get recommendations." Here, they are supplied with thumbnails of 6 items of recommended clothing. Customers can also give feedback by making use of the "tell us what you think that feature" which allows them to enter an opinion rating for the recommended article of clothing. Feedback may alter one or maybe all of the six items that are recommended.

## 3. FINDING RECOMMENDATIONS

Just like sites can apply different methods for calculating or displaying recommendations, so can they utilize diverse methods for allowing customers to access the recommendations. Through our recommender system samples, we have identified four different strategies for searching recommendations (can be more) each of which may provide access to more than one recommendation interface and/or technology. These four methods are ordered in the amount of customer struggle required to search the recommendations.

**Organic Navigation:** Demanding the least amount of work to essentially access recommendations is the *organic navigation* process. In features like Ratings, product Matches, and Feedback profiles, customers have to do nothing further in order to get recommendations. In each of these applications, recommendations appear as part of the product information page. These recommendations can consist of extra items to consider, average ratings, or a list of other customer comments. However, the fundamental similarity is that through the course of normal navigation of the site, customers are provided with recommendations.

**Request Recommendation List:** Requiring not way more work from the customer is the request recommendation list process. Customers who are using applications such as Book Matcher and Style Finder can access recommendations reinforced by their previously recorded likes/dislikes. To do so, they simply should request these recommendations from the system.

**Selection Options:** within the selection options process customers must truly interact with the system so as to receive recommendations. Typically, customers select from a collection of predefined criteria/options upon which to base their recommendations. For an instance, users of Amazon.com Delivers have a range of options from nearly 50 pre-defined categories during which to receive periodic recommendations. Even more involved, users of the site Moviefinder.com's We Predict technique can pick from a limited list of title, format, length, and genre options to define a probe,

as well as customizing options like ranking method and display features.

**Keyword/Freeform:** Arguably, the keyword/freeform option requires the foremost interaction from the customer. In applications like Eyes, customers provide a group of textual keywords upon which to retrieve future recommendations. A version of Album Advisor will collect the freeform input of various artists by which to make recommendation matches. Applications such as The We Predict and Movie Map produce recommendations from the result of a query conducted using the keywords provided. While each uses the keywords in very different ways, each requires users to know specifically what varieties of things they're curious about.

#### 4. THINGS THAT CAN BE IMPLEMENTED IN A RECOMMENDATION SYSTEM

For implementing a good recommendation system in an e-commerce website, we shall include Artificial intelligence and data mining algorithms to study how the customer thinks about different categories of products, also a good recommendation system can analyse customer behaviour of a product that he/she had bought previously which we will see ahead when we discuss those algorithms.

##### 4.1 Data Mining:

Data mining is one of the major processes for finding hidden knowledge in a database. In simple words, we can say that, finding important useful patterns from a very large database. Data mining has provided customers to mine from large databases so that they dig some useful patterns, ways, and hidden knowledge from data. Recently, Data mining has attracted many database experts and practitioners because data mining is useful in many fields like Supermarkets, planning's in the market, decision making, etc.

**Association rule of mining:** Association rule of mining is one of the very important techniques in data mining in databases. The Association rule of mining helps to correlate one or more data items with other data items to find hidden relationships between these data items and give back those relations or results as strong association rules. Association rule of mining is like how one data item X relates to another data item Y:  $(X \rightarrow Y)$ , for this, we need two basic fundamental entities: Support and Confidence. Support is an indication of how frequently the items appear in the data or in other words support is the percentage of transactions that contain both X and Y together. The percentage of transactions, that contains X and also contains Y is

known as Confidence. In other words, the probability of having Y given that X is already in the basket.

$$\text{Support}(X \rightarrow Y) = P(X \cup Y)$$

$$\text{Confidence}(X \rightarrow Y) = P(Y|X)$$

$$\text{Confidence}(X \rightarrow Y) = \frac{\text{support}(X \cup Y)}{\text{support}(X)}$$

**Apriori Algorithm:** In the era of 1994, Mr. Agrawal and Mr. R. Srikanth introduced the Apriori algorithm for searching the frequent itemsets in a database for association rule. Apriori Algorithm itself defines the use of prior knowledge of frequently used item set properties. We applied an approach 'N' frequent itemsets are used to search 'N+1' item sets. How do Apriori works? -

- Firstly, find data item that appears in transactions.
- From this result, find frequent data items.
- Now develop the strong association rule from frequent itemsets using minimum support and minimum confidence threshold.

From this algorithm we get related items that can be placed together to get the maximum profit for the seller and for the customer, it will be easy to find items that he/she might want to buy.

**Example:** Minimum support = 2 and Minimum confidence=1.5

**Concept of Mix-&-Match:** The concept of Mix-&-Match is itself says that it's a process of mixing with a good match to it. We are implementing this concept with the help of the python programming language. In simple words we can say that, finding important useful patterns from a very large database and mixing the items according to their match and similarities. Mix-&- Match is basically a very new concept, as it provides the matching with the same quality of the item but with different brands, on python programming language, using PyCharm as an interface.

**For example,** we have a variety of brands selling a kind of product, the seller will keep an offer of 1 on 1 product with any brand, but it should be the same kind of product only. So, here we'll observe the concept of mix-&-Match.

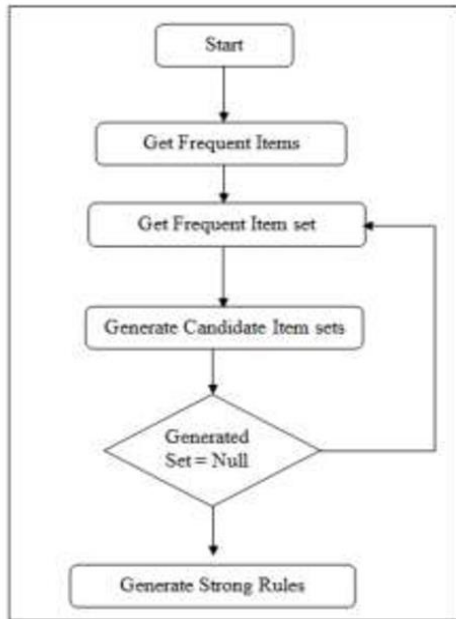


Fig 1. Apriori Algorithm Flow Chart

#### 4.2 NLP:

Natural language processing is an AI technique that can be used to find or recognize key phrases from the text and can recognize places, people and dates, etc. It can also be used for sentiment analysis which can help to study the behaviour.

**Behaviour analysis:** Also referred to as sentiment analysis can be used in recognizing the sentence or paragraph is negative or positive in the reviews or comment section of an e-commerce website. This feature will give sellers an idea about how customers think about their products.

The good thing is by using behaviour analysis, you can not only track these opinions but harvest them. This will allow you to actually take your customer's feedback on board and improve your product at the same time.

**For example:** "This product is worst", Here worst is the key phrase that gave system hint that this subcategory or brand is not suitable for some type of customer.

#### 4.3 Machine Learning:

It is a technology for creating predictive models by finding relationships in data. If we have a large amount of data hence, we can make a relationship based on that data.

Types of Machine Learning:

- **Regression:** regression analysis is a fundamental concept in the field

of machine learning. It falls under managed learning wherein the algorithm is trained with both input features and output labels. It helps in creating a relationship among the variables by approximating how one variable affects the other.

This method can help recommended system by finding the relation between order amount and occasions (weekends/holidays) and draw some of the conclusions that where the sales are maximum and when the customer spends more.

Also, sites can have to draw a relation between product and season that in which season that product sale is high or low.

There can be many such relations we can make and implement in our system.

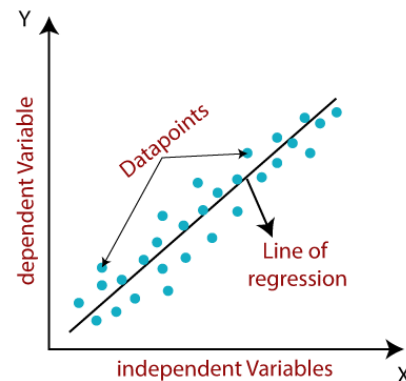


Fig 2. Linear Regression

- **Classification:** In this method, we divide entities into groups by and behalf of that we can draw different conclusions.

**For example,** We can divide customers by their age groups and target them as per their generation trends, like fashion for kids, are different as compared to adults and also it can be different from old age groups of people so their recommendations are also different.

- **Clustering:** It is a form of machine learning is used to group similar items based on their features.

In some manner, it is same as a classification but with slight differences.

## 5. CONCLUSION

E-commerce recommendation systems mainly focus on how e-commerce business can be increased just by recommending people what they should buy. It's just like doing salesmanship from a website.

Recommendation systems in e-commerce websites can be enhanced and more accurate by applying several AI features such as Machine Learning, Natural Language Processing, and Data Mining.

Sometimes the customer does not know what he/she wanted to buy, that's where the recommendation system comes to play. It uses the data previously given by the user in the form of order history, comments, reviews, and ratings. By analysing all this using AI in the Recommendation system, we can achieve better results.

Recommendation Systems not only increase the e-commerce business but make the user experience more user-friendly.

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