# RECOMMENDER IN E-COMMERCE

**Mr.Mandar Ganesh Deshpande, Mr.Shyamsundar G. Goswami, Mr.Rohan Jathanna**

P.G. Students, Department of Master of Computer Application, Vivekananda Education Society Institute of TechnologyHashu Advani Memorial Complex, Collector's Colony, Chembur, Mumbai – 400 074. India.

**ABSTRACT:** Internet users around the world have been growing rapidly and this growth has the opportunities for global and regional e-commerce.

This paper analyses the impact of e-commerce on markets We discuss the relevance of our findings for differentiation in quality, price convergence and decline in profit in a variety of markets where traditional incumbents are faced with changing competitive landscape as a result of e-commerce..

A recommender system based on web mining techniques to trace customer's behaviour and learn his/her preference adaptively. The system can give sensible recommendations, and is able to help web users to save enormous time for internet browsing.

"With Web Intelligence, we can deploy a supply-chain to customers and suppliers so they can analyse pattern and identify processes that will save considerable time and cost."

**KEYWORDS:** Recommender System, Artificial intelligence, Web mining.

## I. INTRODUCTION

E-commerce involves selling and purchasing of goods and services through internet and computer networks. E-commerce helps in increasing economic growth, increasing business opportunities, profitable access to markets.

This paper analyses and shows the impact of e-commerce on markets where established firms offering a broad range of goods and services face competition from Web-based entrants with narrower product offerings

Recommender systems were originally defined as ones in which "people provide recommendations as inputs, which the system then aggregates and directs to appropriate recipients"



*A recommender system… To avoid Information overload!*

**Advantages Of E-Commerce:**

- **Boundary less (global location):** E-commerce is dealt globally as no specific boundary is required. It enables companies to expand them globally.
- **Time saving:** It saves time of customer, because there is no need to go anywhere.
- **No time constraints:** It can be used any time, any place as there is no time constraints.

- **Price/Product comparison:** It helps consumers to compare price and product effectively and efficiently.

- **Cost effective:** Reduces problems related to logistics and puts a small business on a par with well-established ones.

- **Direct communication with consumer:** Online advertising networks, Social networking sites, can be used to advertise about online store.

- **Improved customer interaction:** Feedback and comment forms are features to interact with customers.

- **Flexible target market segmentation:** Target market segment in e commerce is flexible can be modified.

- **Simple and easier exchange of information:** Improves i sharing of information among merchants and customers and enables prompt quick just in time deliveries.

- **Lowers transaction cost:** If online download facility is available then distribution cost can be cut off.

- **Easy arrangement of products:** Online store makes it quite easy to arrange these products.

- **Faster buying procedure**: E commerce means better and faster customer services. The absence of intermediaries for buying product makes, buying procedure will be fast.

- **No physical company set up:** e business is cost effective because physical set up is not required.

- **Easy transactions:** Financial transactions through electronic fund transfer are fast and can be done from any part of the world.

- **Niche Products:** Almost anything can be sold on internet. Even if products are targeted for smaller markets the buyer will be somewhere on net.

- **Low operating cost:** E business can be started and continued with very low investment. Cost of staff is very low.

## II.        OBJECTIVE OF PAPER

As the World Wide Web continues to grow, the size and complexity of many web sites grow along with it.  The users of these web sites are finding it difficult, inconvenient and time consuming to find the information they are interested in. Users find the information that is in accordance with their interests by personalizing a web site. Recommender systems can improve a website for individual users by dynamically adding hyperlinks.

Recommender both Personalized and Non-Personalized can be built using a number of algorithms. Examples include Amazon uses organic navigation and Request recommendation lists.  Commonly used algorithms in recommender systems are Nearest Neighbourhood approach. Some others include Bayesian based approach; model based filtering approach, clustering approach.

- Existing recommender systems face the limitation of requirement of lot of data to make recommendations.

- Changing data is another limitation since trends are always changing. Certain items are unpredictable like movies, music.

- These algorithms are able to search thousands of potential neighbours in real-time, but the demands for modern E-commerce systems are to search millions of potential neighbours.

- Quality of Recommendations is not at par with customers' requirements.

- Collaborative filtering experiences sparsely and cold start problems.

### A. Recommendation Techniques:

Recommendation techniques have a large number of classifications. Of interest in this discussion is not the type of interface, but the sources of data on which recommendation is based on and the use to which that this data is put. Specifically, recommender systems should have

(i)        Background data, the information which the system has before the recommendation process begins,

(ii)        Input data, the information which the  user must communicate to the system so that it can generate a recommendation

(iii)        An algorithm that combines both background and input data to come up its suggestions. On this basis, we can distinguish three different recommendation techniques as shown in Table I

**Table I: Comparing Recommendation Techniques Process**

| Technique | Background | Input | Process | Problem field |
|---|---|---|---|---|
| **CONTENT BASED FILTERING** | The content-based filtering approach has origins in information retrieval and information filtering. The item recommended by content-based filtering often tells about textual information, such as news webs and documents and these items usually describe with keywords and its weights. | u's ratings of items in i. | Generate a classifier that fits u's rating behavior and use it on i. | It parsed text or the features that assigned to items manually. Retrieval techniques work well in extracting features from text documents extraction methods are much harder to apply to multimedia data, e.g., graphical images, audio streams, and video streams. |
| **COLLABORATIVE FILTERING** | As one of the most successful and earliest recommendation technology, collaborative filtering approach works on building a customer dataset from customers and present recommendation by collaborative algorithm. Collaborative filtering approach involves in searching similar preference customers with the active customer. | Ratings from u of items in i. | Identify users in U similar to u, and extrapolate from their ratings of i. | Collaborative systems rely only on users preferences to make recommendations. Therefore, till the new item is rated by a required number of users, the recommender system would not be able to recommend it. |
| **HYBRID FILTERING:** | Features of items in I. Knowledge of how these items meet a user's needs. The algorithm first calculates the similarity ("weight") between two users or two items. The algorithm then computes the weighted average. | A description of u's needs or interests. | Infer a match between i and u's need. | Cold-start problem and stability & plasticity problem. Cold-start problem occurs when learning based techniques. Stability /plasticity problem means that it is sometimes hard to change established users' profiles |

Considering all the above problems, we propose an idea that can be counted as a possible, Plausible, tenable and efficient solution, which will include the study of relevant issues and the current scenarios. The crucial point is that AI is regarding representations, and how they can be constructed, stored, accessed, compared, and transformed. A computer program is a set of representations, a symbol system that models the world more or less adequately

The recommender system based on web mining is proposed to solve problems in earlier system. It utilized a variety of data mining techniques like web usage mining, association rule mining etc. Based on these techniques, the system can trace the customer's behaviour and learn his/her up-to-date preferences adaptively.

### B. Why Recommender systems?

A recommendation system is a mechanism to solve the problem of information overload in Internet. Its importance is to build the high efficient learning algorithm to capture needs of customers and help them what to search.

Web Intelligence has evolved with development of web as a media for information gathering, processing, utilization and storage. It is always-changing and inseparable branch of computer science. The web offers the new means of execute and transmit information eminent beyond the other media. It is a new revolution in information intelligence.

The most important task of the recommender system is to get or gather the customers' up-to-date preferences using web mining techniques, in order to provide decision support for their Internet shopping. Figure 3 gives an overview of the personalized recommender process of the system. We only select few member customers as the target customers for providing recommender services, considering the efficiency of the system maintenance and running. The recommender process consists of three phases as shown in figure 3.

- After required data cleansing and transformed in the form usable in the system, target preferences of customers are mined first in phase 1. In the first phase, how to trace the customer's previous shopping behaviour effectively in the system is important and can be used to develop preference analysis.

- To set different rules of association that are mined from customer purchase database, integrated and used for finding product associations between products.

- To use the match algorithm to find customer preferences and product associations discovered in the previous phases, so the recommendation products list, having the products with the highest scores, are returned to a given target customer.

### III. FORMULATING PROBLEM AND RESEARCH METHODOLOGY

We have tried to mention all those activity or procedures which were carried out during analysis and design of the system which will ultimately lead to final implementation of the recommender system. Descriptive research methodology used to survey which will include the study of relevant issues and the current scenarios and based on data,

explanatory method based on quantitative technique used to clarify and explain how to overcome problem arises in existing system and also to solve them. We have developed a recommendation system to provide personalized information services in making a successful Internet business.

## IV.        CONTENT/ FINDINGS

**How AI based Recommender system is beneficial?**

Basically e-commerce involves buying and selling of goods and services on the internet. The development of e-commerce has led to companies moving much or a part of their business efforts to online environments. Dot com craze has stimulated a global commercial environment. This craze is now being exploited by lot of firms who are engaged in e-commerce.

Concepts of remote access and local storage are the obsolete methods in globalization. The web with integration with these methods, people are getting higher position than any other media for information analysis for business. Complexity and size are the features of WI to make it useful and unique for the companies, research and application. The diaphanous size of the web leads to difficulties in efficient and effective storage and retrieval of web pages. WI is not only networking pipeline, it is also the actual application platform on par with – indeed, integrated within- major operating system. Such applications are known as thin clients. Web documents have links of structured, semi-structured or unstructured information and heterogeneous collection. The vast diversity of web pages forces the user to reconsider many technology and methodology of existing information system. So a new disciple devoted to web related research and application is required that might have a significant value. To accommodate the information of web users need to study the design and implementation of web information system.

- First, the preference of customer and product association are automatically mined from click streams of customers.

- Improved Collaboration filtering that aims to identify customers whose interests are similar to that of current customer, and recommend products that similar customers have liked.

- One of the important features of this is its ability to address the issue of higher recommendation scores being accepted over lower scores .This is done by comparing the distribution of scores for accepted recommendations with analogous distribution for offered recommendations.

- The methodology used in this system improves scalability and also buying precision.

- In this system, the chosen strategy is adopted that for all products in the same classes, those products that were purchased latest would be assumed to be the most popular and the more buyable products. Therefore, we use the choice strategy to provide the recommender services.

## V.        SUGGESTIONS/ STRATEGIES

**A. The System**

The proposed system is .NET based system. The reason behind making it .net based system is its popularity and it's easily available applications. Without writing a single line of code, .NET provides you with a scalable and powerful framework to code upon. Everything in .NET is an object. This means that everything user uses and writes is also an object. This is a useful way of controlling and accessing your Web applications as user deals with properties to retrieve information and helps in responding to events occurring within the application. ASP.NET includes a very powerful and easy to use caching system.

**B. The recommender process consists of three phases**:

- After required data cleansing and transformed in the form usable in the system, target preferences of customer are mined in phase 1 first. In the first phase, how to trace the customer's previous shopping behaviour effectively in the system is of utmost importance and this can be used to develop preference analysis.

- In phase 2, the different sets of association rule are mined from the customer purchase database, integrated and used for finding product associations between products.

- In phase 3, we make use of match algorithm to match preferences of customer and product associations discovered in the previous phases, so the recommendation products list, comprising the products with the highest scores, are returned to a given target customer.

### ALGORITHM OF THE PROPOSED SYSTEM

The overall recommendation process consists of following three steps:
- Customer preference mining
- Product association mining
- Matching algorithm for recommendation

The matching score $\sigma_{mn}$ between customer $m$ and product class $n$ can be computed as follows:

$$\sigma_{mn} = \frac{\sum_{k=1}^{N} c_{mk} p_{kn}}{\sqrt{\sum_{k=1}^{N} c_{mk}^2} \cdot \sqrt{\sum_{k=1}^{N} p_{kn}^2}}$$

Where,

| | | |
|---|---|---|
| C (m) | - | row vector of the M × N customer preference matrix C |
| P (n) | - | a row vector of the N × N product association matrix P |
| M | - | Total number of target customers |
| N | - | Total number of product classes. |

The matching score $\sigma_{mn}$ ranges from 0 to 1, where more similarity between $C(m)$ and $P(n)$ result in bigger value.
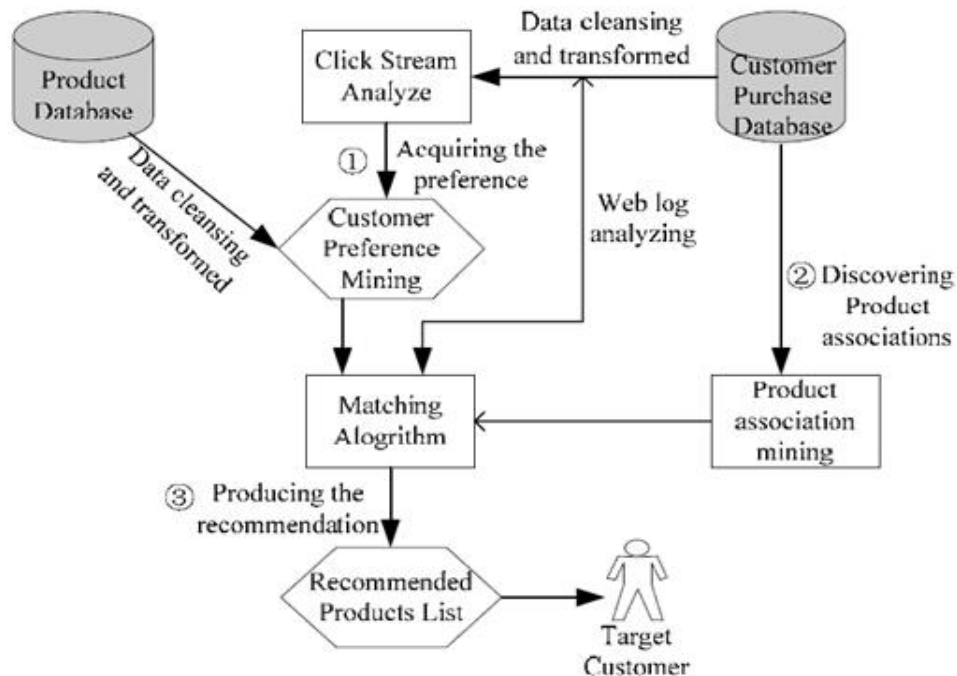
Figure: Overview of the recommender process of the system

## VI.          CONCLUSION

Web Intelligence is a key research field for the development of the Wisdom Web (including the Semantic Web). WI has given environment for analysis and distribution of information to all the concerns for development of business.

The preference of customer and product association are automatically mined from click streams of customers.

The matching algorithm which combines the preference of customer and product association is utilized to score each product and produce the recommended product lists for a specific customer.

An important issue addressed here is evaluating the recommender quality is the degree to which recommendations with higher recommender scores are accepted over recommendations with lower scores. This issue is addressed by comparing the distribution of scores computed from the formula of calculating matching score for accepted recommendations with the analogous distribution for offered recommendations.

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