

Knowledge Generation through Web Mining Techniques for e-Business Recommendation System

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Abstract

World Wide Web plays a vital role in global information service center. There is the paradigm shift in the e-Business computing for the data collection and knowledge generation. The online-business is growing very rapidly by creating website for the business. Due to exponential growth of dynamic information over the internet by the websites, information overload create big challenges for the researchers in this area. Web data engineering is the best concept for dealing these challenges. Web business is very easy and efficient way to do the business but it creates the competitive environment. This paper discusses the idea about the web mining techniques, knowledge generation frame work used in recommended system for both consumers and several web business operations of any organization.

Keywords: Web Mining, Web Artificial Intelligence (WAI), Recommendation System, Web Information Technology (WIT), Web Trends, SurfAid, Knowledge Engineering, Knowledge Generation.

INTRODUCTION

Web engineering is a new improvement for scientific and technical research and development that discovers the essential roles as well as realistic impact of web artificial intelligence (WAI), for example, learning disclosure and web mining, learning portrayal, arranging, scholarly operator, and interpersonal organization knowledge, and additionally web data innovation (WIT), Web-enabled items, frameworks and their administrations

According to the ASSOCHAM India's online business income is required to cross from \$30 billion of every 2016 to \$120 billion of every 2020, it is developing with 51% of yearly rate, or, in other words on the planet. Approximate 25 million new internet users associated annually. India is preceded of countries like Brazil and Russia even within the BRICS nations. It has 400 million Internet user up to 2016

whereas Brazil has 210 million and Russia has 130 million of internet users. Surprisingly, about 75% of internet users are age group of 15-34 years since India is one of the youngest demography globally. This shows that they are focused on younger visitors. The large number of online customers is belonging to 15-24 years of age group which is very interesting things.

From last few decades, there has been a remarkable increment in use of World Wide Web (WWW) data for a wide range of variety of web based business applications. Therefore a variety of web based tools are developed to solve the problems in E-commerce business applications. There is required to improve Intelligence tools of Web Engineering Applications in the context of web business and Information Technology (IT) industry.

As per the Financial Advisory Services–Team RBSA approximate 55 percentage growths of Indian e-Commerce industries in last six years. The fast emergence of e-Commerce is drastically transforming the business landscape. Startup firms are capturing new opportunities in the electronic market place through existing or innovative business models. Established firms are also wanted to transform and adapt their old business models to the new in this environment.

Nowadays, the information freeway boost the success of E-commerce. It gives the idea about the virtual market both for the merchants and customers; they can easily interact with each other, and then have their dealings within a specified time. With the continuous development of electronic commerce, it is not easy for customers to select the appropriate merchants and find the most required products when they are compared with the huge product information in Internet. In the whole shopping process, customers still spend more valuable instant to visit an overflowing of retail shops on Web sites, and gather valuable information by themselves. This process is prolonged, even sometimes the contents of Web document that customers browse are inappropriate to do with those that they need indeed. So this will inevitably influences customers' confidence and interests for shopping in Internet. Thus it is required to create such a system that overcomes these problems. Recommended system minimized these problems. To create such system modeling and analyzing web navigation behavior is helpful for understanding what information online user's demand. 'Information filtering' is an efficient method to manage the flow of huge information. The fundamental aim of 'information filters' is to only explanation users to information that would be relevant

to them the processes involving this process is called mining.

Recommended system facilitates successful E-marketing by focusing on aspects of bettering customer relationship, creating communities of interest and most importantly, building trust.

Web-Page Recommendation

Although the search engines help customers to search for product and service related information on the Internet, but it will be effective only when they have a clear idea of what they want. More often, people have no specific information needed to surf the Web to read news, interesting blog posts, etc. Recommendation systems produce some effective suggestions related to the specific search by removing irrelevant information. The design of recommended systems for web content have significant challenges due to the highly dynamic nature of web pages, and the high level of irrelevant introduced by the analysis of the user-browsing data.

The aim of this paper is to allow the analyst to:

- Efficient way to discover frequent pattern and time ordered event patterns.
- Automate the procedure of occasion design disclosure utilizing input circle.
- Enhance these occasion designs with statistic identified with the procedure that produced them.
- Classify the commonalities among the event patterns.
- Suggestion for the events back to the process that generate them.
- Estimate future events, based on history of event patterns.

Knowledge Based System

In the knowledge based system we make the differences between knowledge used and the procedure used for the processing it. This is helpful in the incremental

development of knowledge bases while the processing procedures are remain constant for a range of applications. Psychologically it very difficult to a human to describe that what knowledge he/she can use. Representation of knowledge: Knowledge can be represented in terms of knowledge based program in different paradigm for example predicate logic, rules that is if condition then action.

Related Work

In the recent years the WWW has experienced a tremendous increase in the amount of data but it is posing lots of challenges for user while accessing the data. The concept of web recommendation was introduced to address the E-business organizations. With recommendation the contents of a web page are modified so as to fit in the desires of the user as well as for the betterment of the organizations. Much of the research work has been carried out in the field of web personalization. Web recommender systems are in great demand these days and are gaining a lot of attention in the research community. The literature review present in this section broadly gives an overview of the research work carried out in this area.

The concept of E-business [1] applications are emerging in a number of domains of online businesses, end-users, financial, shopping, travels, services etc.

S. K Sharma and U Suman [18] done the comparative analysis of different recommendation systems for E-commerce with Semantic Enhanced Personalizer (SEP). It was observed that SEP was better technique of hybrid recommendation than other systems because its recommendation was more accurate relevant items with minimum false positive rate with lowest time complexity.

Abdul-Aziz Rashid Al Azmi [4], talked about the distinctive digging devices for

the organizations, for example, information mining, content mining and web mining to discover concealed learning in huge databases. The paper discussed how business intelligence was achieved using the mining tools, and faced problems like integration, technological, ethical and legislative in E-business.

Z. Zeng [17] proposed intelligent E-commerce recommender system using web mining based on the product, he categorized the customers into three categories product's visit, product's selection and product's purchase parameters for recommendation.

P. Lopes and B. Roy [10] proposed dynamic recommended system using web usage mining for e commerce that is evaluated by user based and product based techniques. Sneha. Y.S, G. Mahadevan and S. MuthuLakshmi [9] proposed recommendation system in e-commerce facilitates the finding, collection and analysis of data on business and its impact on shoppers including their needs and desires by providing valued feedback on the possible effect of E-business on the lives of people.

M.K.Singh et al.[6] was discussed the different issues in association rule mining, like integration of information, data structures, storage etc.

R. Bhushan and R. Nath [16], proposed a recommendation system that optimized the user's web log using page ranking that can helpful for recommendation.

Evolutional goals of business knowledge framework in E-business, investigates the application method for business insight and the working component of business insight framework in E-business, and more elucidates the operational structure of E-business knowledge framework [7].

M.K.Singh et al was discussed about the relevant information on the basis of user behavior like link visits and ranked the page with mostly used by calculating the hits, but there was a limitation that when new page was generated had less preference while it may contained highly related data.

Clendaniel [13] holds that some companies are generating about 1 gigabyte per day of customer behavior data including every page the visitor view, the viewing sequence, how long the visitor stayed in this page. However, many companies only use the metrics of page hits and click-through rates, & the data are stored off-line, unused in immense structure backup.

J.Darmont et al [12] propose a modeling process for warehousing diverse web data and design a java prototype that transform multiform data into Extensible Markup Language (XML) document. A good data research improves the appearance of data mining algorithms. Song and Sheppard [14] demonstrate that web user clustering, web page clustering, and regular access path identification can be used for the sake of marketing strategies, personalization, and web site adaptation. They view the topology of a web site as a directed graph and mine web browsing patterns for e-commerce. They use vector analysis and fuzzy set theory to cluster users and URLs. Their frequent access path identification algorithm is not based on sequence mining.

X. M. Jie et. al.[19] developed a personalized recommendation system for E-commerce and introduced UserID-URL associated matrix according to log information. They calculated UserID-URL matrix and distance matrix to cluster users into groups and recommended effectively personalized recommended goods.

According to Web Analytics,[15] Click Tracks let user how to know more about buyers and thus gives insights on how to turn more web site visitors into buyers.

“Click Tracks lets user to see buyers from many different aspects, such as identifying their entry points, the paths they take and things they do on the way to the checkout. Click Tracks thus gives all the valuable information to the user that he (she) can put into action. Web Usage Mining is mostly used in user behaviors that use the web site [3] that is very helpful for E-business. It has several issues because it involves number of data mining techniques. Like Session identification, catching etc. S. Vijiyaranil and E. Suganya [2] were discussed different issues in web mining like relevant information, integration of information, automated data cleaning, mining sequence and time series data, personalized web agents, session identification, transaction identification etc. Gaurav Dubey, ArvindJaiswal [11] have managed the test of affiliation govern mining issue in finding incessant thing sets utilizing GA based strategy. In any case, they saw that a more broad experimental assessment of their proposed strategy is a promising future research "information can live in a conveyed way over a system learning is the demonstration of perceiving designs molded by complex systems [28] not as a main priority of person."

D. Mourtzis, M. Doukas were developed methods towards integrating the customers into the design phase of personalized products, granting them an active role in the configuration of the supply chain. The paper [5] gave the idea about web usages mining can act as an effective solution to overcome the limitations of traditional recommend systems. The entire web usages mining process is divided into mainly three steps first is data preparation, second is pattern discovery and last is pattern analysis [10] most of the data needed for web log analysis reside on web servers, proxy's enterprise logs, web clients etc.

M. K. Singh et al [25] were discussed that knowledge extraction through page ranking.

M.K.Singh et al. [25] discussed the application of page ranking in the web recommendation system.

WEB MINING TECHNIQUE

A technique that is used to access or retrieve the knowledge or information related to a particular domain from the World Wide Web (WWW) data base is called web mining. It is used to discover

the different types of patterns in World Wide Web or we can say that it is the process to gather the all relevant information and large database (data mining) related to World Wide Web. World Wide Web documents and services of the web mining can be mainly divided into three categories as shown in figure 1.

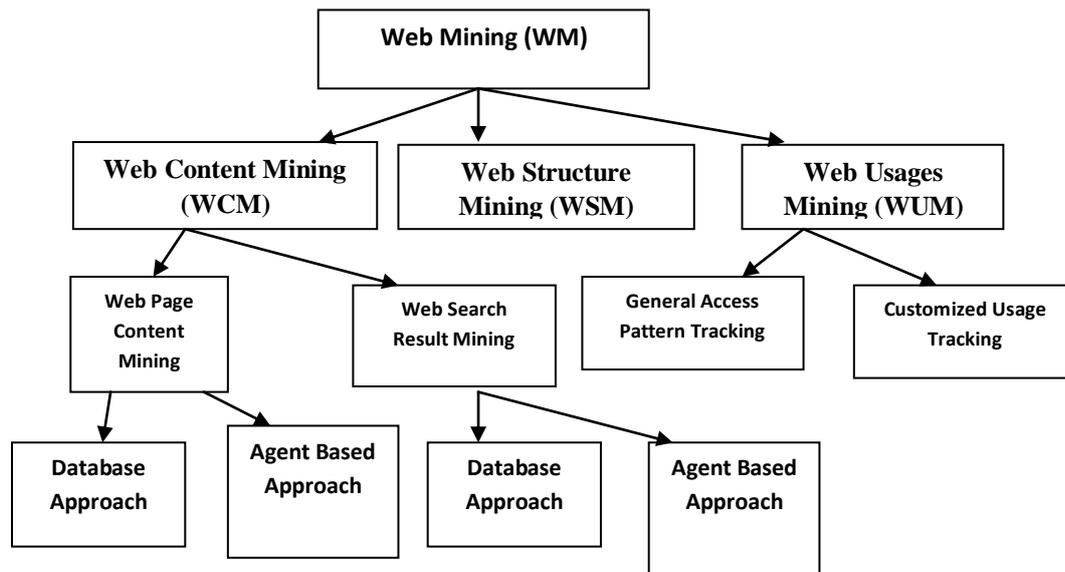


Fig: 1. Classification of Web Mining Techniques

Web Content Mining (WCM)

it is a web mining technique that is based on the rich contents in the text. It is the importance on the content of the web pages not its links. Information written on the web page uses some HTML tags these are semi-structured data. These tags are helpful to search the relevant information. The main concept of web content mining is to identify the key contents present in text documents.

can help in sifting or positioning Web pages. Specifically, a connection from page A to page B can be viewed as a proposal of page B by the creator of A. Some new calculations have been recommended that build up this connection structure for catchphrase seeking, as well as different assignments like naturally assembling a Yahoo-like chain of importance or distinguishing networks on the Web.

Web Structure Mining (WSM)

In this type of mining tries to find out the fundamental link structures of the Web. The model is based on the topology of the hyperlink with or without the link explanation. This model can be utilized to classify the Web pages and is helpful to create data, for example, closeness and connections between Web locales. What's more, the connection structure of the Web contains imperative suggested data, and

Web Usage Mining (WUM)

In the Web Usage Mining is to find the user navigation patterns from web data and the useful information from the secondary data resulting from the interactions of the users while surfing on the Web. The main concept of web usages mining is to process the user navigational behaviors during the interaction with the system stored on web server.

In this categories of web mining described above have its own application areas including site improvement, business intelligence, Web personalization, site modification, usage characterization and page ranking etc. The search engines to find more important pages generally use the page ranking. Implement PRNLV method use web structure and web uses mining technique to rank web pages and its application in web recommendation system.

Web Data Engineering in Knowledge Discovery

Internet is a gathering of tremendous measure of information. There are different type of information like organized databases, semi organized databases and unstructured databases. These databases must be mined with the goal that valuable data is to be removed. There are following strides in web information designing in learning revelation as appeared in figure 2 learning disclosure structure.

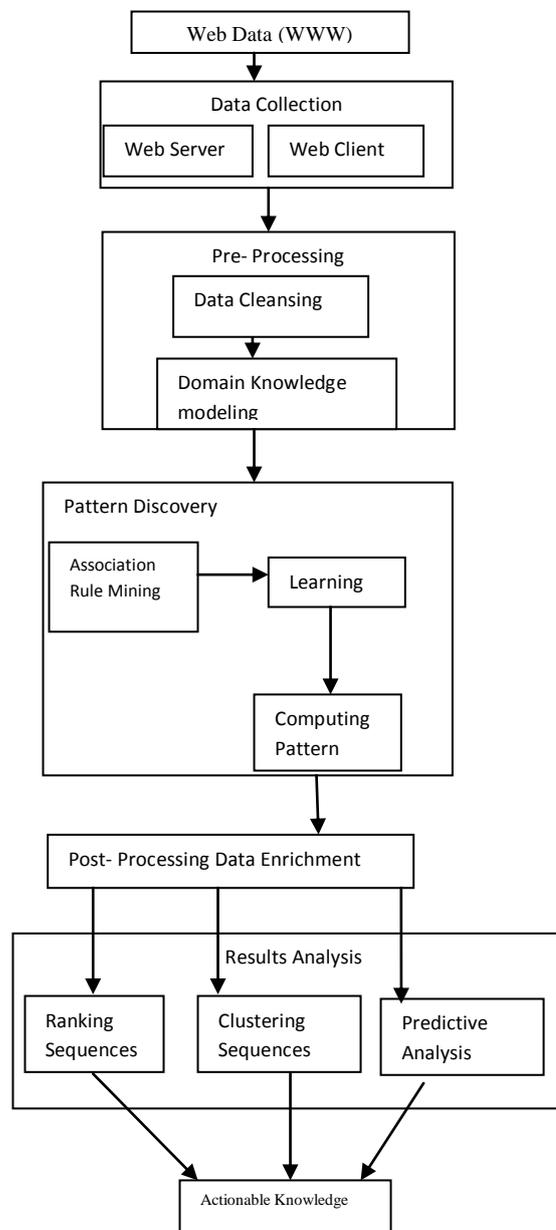


Fig: 2. Process of Knowledge Discovery

Data collection

Web data is very dynamic and heterogeneous in nature. It is stored in different places and in different form. Data may be collected from Web servers, proxy servers, web client etc.

Web Server Data

Web server data means data stored on the web server. It contains all the credential of the users associate with that server. It also contains the navigational behavior of the users that are widely used to identify the nature of the user that is which sequences are followed by the customer.

Application Server Data

Commercial application servers like. Web Logic, Story Server etc have important features in the framework to enable on line business applications. By processing these data we can track the various kinds of business actions.

Application Level Data

Data available on the application server can also be split into three different kinds on the basis of the source of its collection like on the server side, on client side and the proxy side.

Server side data conations all users associated with that system while client side data contains user wise information which are the main issue during processing.

Data Pre-processing

In this strategy the important data is to be removed from unique database file since not all the data are substantial for web use information mining. The first database file is typically comprised of content files that contains expansive volume of data identifying with inquiries made to the web server in which in many examples contains superfluous, fragmented and uncertain data. The following actions must be taken in this step.

- Convert all the measured in the metrics form so that it can be easily computed.
- Convert various codes of different sources into the same format.
- Use domain knowledge to ensure the semantic of the source data.

Pattern Discovery Techniques

In this module there are different web mining systems have been connected for effective mining of web use logs. Different example revelation strategies are utilized to distinguish the succession of example, similar to math investigation, affiliation manage mining, bunching or gathering of information or data, order and consecutive example mining. All the on line users can be categorized as click user, product selected users and product purchased users.

There are mainly three types of associations are used in between product and users. Let U and P denote the set of users and products

view(c,p).

select(c,p).

purchase(c,p)

Where c and p belongs set of customers C and products P respectively, view(c,p),select(c,p) and purchase(c,p) are the customer that view select and purchased the product using website respectively.

Statistical Approach

The types of statistical information given in Table 1 are usually generated periodically in reports and which is beneficial for administrator in the improvement of the system performance, in the site modification task, improvement in the security of the system, and provide the support for marketing decisions. There are many web traffic analysis tools, like [WebTrends] and [SurfAid], are available for generating web usage statistics.

Table:1. Statistical Information Discovered from Web Logs.

Statistics	Detailed Information
Web action data	Total number of the visits Regular number of clicked Successful/failed/redirected/cached clicked Standard view time Average Path length of a Site.
Diagnostic Statistics	Exception 1.Server not reachable 2. Page not found/Loading error
Server statistics	Recent pages visited Entry/Exit pages single access pages
Referrers Statistics	Refresh rate Search engines Top search keywords
User demographics statistics	Peak geographical location Most active countries/cities/organizations
Client statistics	Visitor's web browser, operating system, and cookies etc

User Oriented Data

User based data are categorized as follows.

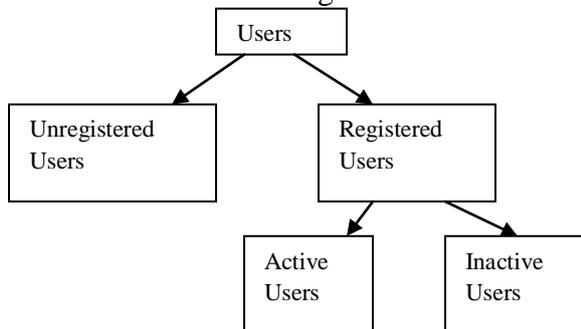


Fig: 3. Categories of Users

Product Oriented Data

The product oriented data are categorized as follows.

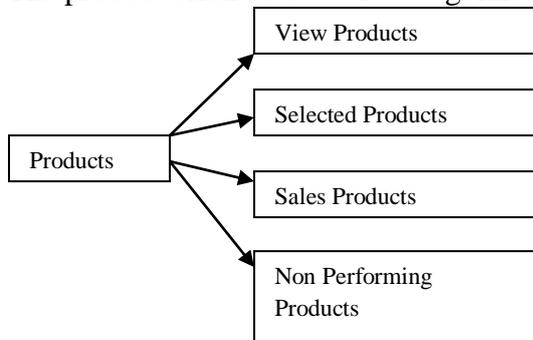


Fig: 4. Categories of Products

Association Rule Mining

Association rule mining is a technique that finds out the remarkable association or between the elements of two different sets. Basically it is a mapping $f: A \rightarrow B$ that is how the elements of set A are mapped with the elements of set B. As the above categories of users and the products, different type of products are associated with the different types of users. Market basket analysis is one of the best example for describing association rule mining. By using association rule one can analyze the buying habit of any consumer. This information is widely useful for the retailer to develop marketing strategies. Web usages mining play a vital role to identify the correlations between web pages of different pages that can be accessed and manage by any E-commerce website during a server session.

Analysis of the Product with Customer

In this section product and customer analysis is done with the help of preference rank of each product or service provided online

Predictive Analysis

This module uses the history of the customer navigational detail during interaction with system in order to predict future interest. Table 1 **Predictive Analysis**

The identified patterns represent an approximation of the past behavior of items under examination. This kind of analysis is extremely useful to the business analyst, since it enables them to make predictions and anticipate future events.

Clustering Sequences

Clustering is a process of grouping items of same category on the basis of characteristics of the items. A cluster is a collection of data items that have the

similar characteristics and differ from the items of other cluster. Web usage mining, clustering technique categorized the clusters into two main categories called user clusters and item or product clusters. User clustering is based on the similar behaviors of the users during navigation of the system, while product clustering is based on the characteristics of the products. K-means clustering is most suitable algorithm used to cluster the different customers that show the interest on product wise. The knowledge base used for clustering are as follows

Likes (Customer, Product)

Ranking Sequences

This module uses knowledge of different clusters of product or services based on the size of the clusters. The processes of ranking is to combine the objective of the business metrics to the subjective domain knowledge of the business. The outcomes of this technique to capture the issues of business performance based on available information. Hence the analyst can examine huge volumes of data to find the most relevant to a particular aspect of the business.

Actionable Knowledge: The final result is asset of reports with the aim of summarizing the result of preceding data analysis. That can be used in recommended system.

Example1: Let us assume following table of information of any hypothetical online Business organization customers of in thousands.

Table:2. Example dataset of product purchase

Time period	Product code	Number of Customer view the products	Number of Customer select the products	Number of customer purchased the product
Jan 2017 to March 2017	P001	115	7	4
	P002	222	10	8
	P003	90	1	0
April 2017 to June 2017	P001	119	12	9
	P002	118	9	10
	P003	100	2	1
July 2017 to Sept 2017	P001	122	10	8
	P002	126	13	7
	P003	10	0	0
Oct 2017 to Dec 2017	P001	114	8	6
	P002	134	20	12
	P003	12	1	0

Post- Processing of Information Enhancement

The pattern that came out as the after the result of pattern discovery is not enough, main information needed to identify the product that participate in each one of these patterns that is performing and not performing products. Following information is associated with each purchased product during pattern generation.

- Number of visits supporting the purchase of the product.
- Five most common locations of the purchased product.
- Suitable time periods of the purchased product.
- Five most common navigational detail the visited customer who have not purchased.
- Way of marketing process of purchased.
- Five most common competitors for the same product.
- Common problem codes for not purchasing the product while the customer select the product.

Result Analysis

The amount of information generated in the previous post preprocessing. This information are to be used to generate a list with the causes of notpurchased products that is not performing products.

On the basis of above information it is easy to give the answer a small sample of questions as

- Show the k most frequent purchased products.
- Show reasons of the selected products which were not purchased.
- Show the performance of the product location and season wise.
- Show the major competitors in respective to the product.

The performance of the as shown in the table it is clear the product of id P003 in like a non performing while product P002 is highly performed product.

WEB MINING FOR E-BUSINESS COMPUTING

Web Mining (WM) play a vital role in online business processes likeonline customer's navigation behavioral behavior, information of competitors by sending intelligent agents to certain targets, such ascompetitor's sites. It tracks the host web server and collects as much information. Using these information enterprises can establish better customer relationships, offers and target potential buyers with exclusive deals. This information is very valuable for the business operations like marketing, human resource management, financial management, sales management, fraud

analysis, customer services, and prediction inventory management.

Marketing

Marketing is typically defined [21] as *"Marketing is the ongoing process of moving people closer to making a decision to purchase, use, follow or conform to someone else's products, services or values. Simply, if it doesn't facilitate a 'sale', then it's not marketing."* The web mining techniques change the marketing processes by creating the product recommendation. It helps to identify the area and trends analysis of the products in very efficient manner by analyzing the information.

Human Resources Management

The web mining techniques gives the idea about the management of the human resources in the global aspects. Role of Human Resource department in any business enterprise is to identify and match the right skilled personnel with the right function this can be perform by variety of interviews some enterprise organize online interview. The recent study [22] has shown initial promise in this direction. The Web mining techniques like sequence similarity approach helps in the development of recommendation systems that map the employees with their aim to reduce their click through path length to answers the questions.

Sales Management

Sales management is the key responsible function the organization. It is the enterprise's core-competency to customers; main goal of this is to maximize revenue of the enterprise. There numbers of organization works only for the sales management they use management strategy to maximize the sales revenue, by both bring the customers to door, and execute a good sales and operations in the final sale. Web mining is play a vital in business analytics [17]. With the

continuous development of different inclinations of business relationship like business-to-business (B2B), business-to-customer (B2C) and customer-to-customer (C2C) E-commerce, web sites like e-Bay, amazon.com, flipcart.com, olex.com etc. collect huge amount of data about buying behavior of customers like customer's buying preferences, information about buying power of customers etc. that are used in business analysis for increasing the sales of the product and services.

Businesses Financial Management

Financial management deals funds used in different departments of the enterprise and projects in the consideration of minimizing the risk and maximizing profit of an enterprise. Financial management includes two main kinds of issues. Funds provided to the company from other sources that is funds could be long-term or short-term. In the second kind it deals with 'fund management'. The main goal is to identify different issues such as strategies, time lines, and risk. Web mining techniques help to provide the information related to it in very efficient manner by analyzing it the enterprise can take the decision.

Fraud Analysis

Fraud is defined as the use of false representations to gain an unjust advantage or abuse of an organization's resources, such as illegal access to an organization's finances [23]. For example, credit card fraud debit card frauds are common that causes the loss of millions of dollars of the card holders therefore the company like Visa and MasterCard are analyze data in order to identify fraud. They used web mining techniques for data analysis. Nowadays Different type's money wallets are available for secure payment during online shopping, they not guaranteed of avoidance from fraud yet, awareness of the online customer is only the way.

Customer Service

The aim of customer service is to process the customer queries related to the buyers ask after their purchases and from the processes leading up to the purchase that will increase the value of the product. There are many such types of companies create a new department called customer service call centers to deal such types of problems, especially they deal in retail-based operations, in order to address their need. The advances in Web-based recommender systems may enable the automated query receiver to improve call center capacity using expert-based recommendations online [24].

Conclusion

We conclude that web data engineering is one of the most popular and fastest-growing IT research field in the era of the World Wide Web (WWW), knowledge web, grid computing, intelligent agent technology, and social computing which is helpful in the knowledge base creation for online businesses operations. It is constantly deliver the new apparatuses and procedures for making savvy undertaking entrances that can serve clients shrewdly. In this paper it talked about that how web mining calculations have been utilized for recent years in different distinctive spaces information building, since they give the capacity to break down immense accumulation of web information. This paper also discussed the processes that generate these data for knowledge discovery for business analyst in E-business context. It plans the manner in which that proselytes the web mining results into significant information that the business investigator can use to enhance the business tasks. This actionable knowledge is widely used in web recommendation systems.

REFERENCES

1. Jaideep Srivastava, Robert Cooley
“Web Business Intelligence: Mining
the Web for Actionable

Knowledge”Published in INFORMS
Journal on Computing: Vol.15, No. 2;
pp.91-207, Spring 2003.

2. S. Vijayarani and Ms. E. Suganya
“Research Issues in Web Mining”,
International Journal of Computer-
Aided Technologies (IJCAx) Vol.2,
No.3, July 2015.
3. Jaideep Srivastava, “Web Mining:
Accomplishments & Future
Directions”, University of Minnesota
USA, srivasta@cs.umn.edu,
<http://www.cs.umn.edu/faculty/srivasta.html>.
4. Abdul-Aziz Rashid Al-Azmi”
Data,Text and Web Mining for
Business Intelligence: A Survey”
International Journal of Data Mining 7
Knowledge Management Process
(IJKP), Vol 3, N02, pp 1-20 March
2013.
5. B. Mobasher,R. Cooley, J Srivastava”
Automatic Personalization based on
web usage mining”,Communication of
ACM,vol 43 no 8 pp 142-151,2000.
6. Mahesh Kr Singh, Zaved Akhtar
“Challenges and Research Issues in
Association Rule Mining” in
International Journal of Electronics
and Computer Science Engineering
(IJECS), ISSN-2277-1956/V1N2-
767-774 in Volume 1 May 2012.
7. Jie Huang. “Research on Mechanism
and Applicable Framework of E-
business Intelligence”. E-business and
E-Government (ICEE). International
Conference on Digital Object
Identifier. Page(s): 195 – 198 IEEE
Conferences, 2010.
8. Mahesh Kr Singh, Daveshe Kr Sharma
“Page Ranking Algorithm based
number of link visits: An
implementation” in National
Conference at IMS, Ghaziabad in
November 2012. NCETIT-2012
9. Sneha. Y.S, Dr. G.Mahadevan and S.
Muthulakshmi “A Critical Review of
Recommender Systems in Web Usage
Mining Based on User
Ratings”International Conference on
Artificial Intelligence and Embedded

- Systems (ICAIES'2012) Singapore, pp 23-26, July 15-16, 2012
10. P.L and B Roy “Dynamic Recommendation system using web usage mining for E-commerce users” ICACTA-2015, p 60-69, 2015.
 11. Gaurav Dubey, ArvindJaiswal, “Identifying Best Association Rules and Their Optimization Using Genetic Algorithm”, International Journal of Emerging Science and Engineering (IJESE) Volume-1, Issue-7, pp: 91-96, 2013.
 12. J.Darmont,O.Boussaid and F. Bentayeb,”Warehousing WebData 2007”,<http://www.arxiv.org/ftp/arxiv/papers/0705/0705.1456.pdf>, 2007.
 13. T. S. Clendaniel, Profitability and mining web data: Avoiding the path to red ink, The Data Administration Newsletter (R.S. Seiner, Publisher, 2002), <http://www.tdan.com/i019fe02.htm>.
 14. Q. Song and M. Shepperd, “Mining web browsing patterns for e-commerce”, *Comput. Indus.* 57(7) pp 622–630,2006.
 15. Web Analytics (2007) <http://www.clicktracks.com/>, viewed as 25 October 2007.
 16. R.Bhushan, R. Nath “Recommendation of Optimized Web Pages to User Using Web Log Mining Techniques” 3rd IEEE International Advance Computing Conference (IACC),pp 1030-1033,2013.
 17. Ziming Zeng “An Intelligent E-Commerce Recommender System Based on Web Mining” International Journal of Business and Management(IJBM),Vol. 4, No. 7, pp 10-14, July 2009.
 18. Sanjeev Kumar Sharma and UgrasenSuman “Comparative Study and Analysis of Web Personalization Frameworks of Recommender Systems for E-Commerce” ACM 978-1-4503-1185-4, pp 629-634, 2012.
 19. Xia Min-Jie and Zhang Jin-ge “Research on Personalized recommendation System for e-Commerce based on Log Mining and user Browsing Behaviors” ICCASM 2010, 978-1-4244-7237-6 IEEE pp v12-408-411, 2010.
 20. Amit Tiroshi, ShlomoBerkovsky, Mohamed Ali Kaafar, David Vallet, Terence Chen, TsviKuffik“Improving Business Rating Predictions Using Graph Based Features”ACM 978-1-4503-2184-6, pp 17-26, 2014.
 21. Norris, B, What is Marketing?,<http://www.briannorris.com/whatismarketing.html>.
 22. Bose,A; Beemanapalli,K; Srivastava, J; Sahar, S, "Incorporating Concept Hierarchies into Usage BasedRecommendations", WEBKDD 2006, August 20, 2006,Philadelphia, Pennsylvania, USA.
 23. Bolton, R. and Hand, D.,” Statistical fraud detection: A review”, *Statistical Science*, Vol 17(3), pp. 235-255,2002.
 24. DeLong, C., Desikan, P., and Srivastava, J., “USER (User Sensitive Expert Recommendation): What Non-Experts NEED to Know” Proceedings of WebKDD, Chicago, Illinois, 2005.
 25. M. K. Singh, O. P. Rishi, A. Sharma, Z Akthatar “KnowledgeExtraction Through Page Rank Using Web Mining Techniques for E-business: A Review” a chapter in” Maximizing Business Performance and Efficiency through Intelligent Systems” publish at <http://www.igi-global.com/book/maximizing-business-performance-efficiency-through/173010>, pp 1-30 March 2017.
 26. M.K.Singh,O.P.Rishi,S.Wadhwa “Application of Page Ranking Algorithm Based on Numbers of Link Visitsin Web Recommendation System for Online Business.GJECS , Vol3, No.2 pp 1-10 Sept 2018

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