

# Internet of Things in E-commerce

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**Abstract** — The advancement in information technology has increased the need for network enabled marketing. This is necessary to service a broad class of stakeholders including end users, publishers and logistics. An Intelligent Book Recommendation System is proposed whose functionality is to retrieve reviews pertaining to a particular book from different merchant websites and analyze these reviews sentimentally in order to determine the quality of the study material. The proposed work aims at implementing an E-commerce portal for selling technical books, with different views for each stakeholders participating in the E-commerce system. Sentimental analysis leads to a confidence value, which help users to take decisions regarding the selection of the book. A modular approach has been used involving modules like End User module, Publisher module and Logistics module. End user interface provides the list of books suitable or the user along with its description. Publisher module allows the book publisher to maintain a bookshelf in the portal where all the books published by a particular publisher is listed along with its details. The Logistic module provides an efficient interface to maintain a list of orders to be delivered. The distribution managers can select the location from the select list, where they wish to deliver the product on a particular day. The portal returns an optimal route to the selected locations so that the delivery of product can be done in an efficient manner with minimum cost. Optimal route is determined by using Google maps API and a TSP variant. The proposed work attempts to make the E-commerce industry fool proof.

**Keywords** – E-Commerce, Sentiment Analysis, IoT, reviews.

## I. INTRODUCTION

E-commerce has been with us for a while but the social web and mobile phones have supercharged its growth. And networking has enabled the E-commerce giants ( like eBay, Flipkart) to strive in the market by ensuring an effective customer relationship. The social web and adaptability mobile devices like mobile phones, tablets have also helped in supercharged growth of E-commerce. E-commerce is defined by Zwass [1] as the effective sharing of business information followed by maintaining business relationships, and then performing the business transactions by the underlying telecommunication networks. According to recent data, the number of digital buyers in India alone is expected to reach 41 million by 2016, representing some 27 percent of the total number of internet users in the country. Furthermore, a growing number of people in the Asia Pacific area are increasingly using their mobile devices for online shopping. Electronic commerce draws on technologies such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction

processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems.

Modern electronic commerce typically uses the World Wide Web for at least one part of the transaction's life cycle, although it may also use other technologies such as e-mail. Application of E-commerce at a large scale is seen in the online shopping websites for redirecting the sales to the customers, along with providing and participating in online marketplaces as a means to process a third-party business-to-consumer or consumer-to-consumer sales, congregation and usage of demographic data through the social media, business-to-business electronic data interchange, pretail launching of new product or services, and marketing to established customers through e-mail or fax in the form of newsletters. Ecommerce has massively matured in the last decade and it's still growing fast, bringing different products and services on the table for the consumers all across the world. We are living in exciting times, where digital means are becoming smarter and advanced day by day. Innovation has become integral for the success of an enterprise. The major drawback in the existing system is the involvement of the manufacturers and traders who use the loopholes in manipulating the reviews and ratings in favour of their products. Moreover there are no existing government bodies which can actually look into the problem and keep an eye on these malpractices and lay down rules enabling strict action against the culprits. The geo-ordering clustering process followed by E-commerce applications is not accurate to the point where it can bring in satisfactory result. There are also chances where the companies fail to identify the in-house logistics and chances of losing an important share based on the obtained review is high.

Major Ecommerce sites typically offer features such as related product listings, reviews and ratings. Consumers also expect the option to read product reviews. These ratings and comments are often more persuasive than the best written product descriptions. Since the reviews and ratings are generally maintained by the Ecommerce officials or in some cases the vendor itself, there is a huge chance of faking the reviews regarding the products. Some online merchants have also been accused of purchasing reviews from individuals or agencies. These reviewers may or may not have actually used or handled the product. For example, a worker on Fiverr, is offering to review two digital products for \$5. Other crowd sourcing marketplaces like Amazon's Mechanical Turk and Digital Point and online classifieds like Craigslist have fake review jobs posted. While e-commerce offers online retailers a world of opportunity, success is defined by how well they

service and retain their customers, which is taken care by logistics or Distribution Management systems in place. Logistics is to be the game changer for ecommerce in recent years. Companies that struggle to manage in-house logistics sometimes turn to third-party providers to handle orders, inventory, shipping and returns. Others bring logistics in-house to better control speed and accuracy of delivery – both increasingly important as consumers' patience and error tolerance diminishes. One more important factor to consider is the efficiency of reverse logistics (i.e. return of product). Today, most of the ecommerce players use geo-ordering clustering process, wherein, all the orders are grouped into clusters according to the locality. These mechanisms have surely benefited the ecommerce players, but there is scope for improvement.

The proposed work "E-Sale-Buy Portal for Technical Books" is a prototype for the working of an E-commerce website, having Technical Books as its product. Internet has taken over the era, and has its effect on all scopes of life including business. The motivation behind this is to incorporate these advanced networks and computing technologies in business and yield a better result. The motivation behind "E-Sale-Buy Portal for Technical Books" is to simplify the tedious task of exploring books in physical marketplace and thereby enabling the end - users to buy them at a reasonable price. Online market is transparent enough to allow for product comparison for the shoppers. It also helps in bringing in a honest opinion regarding the study material by incorporating Intelligent Book Recommendation System. The proposed system further forms a structured collaboration of publishers, distributors and end-users on a single platform.

Several existing e-commerce websites have attempted to provide an online solution for sale and purchase of text books. But the need of the hour is a hassle-free, tailored platform for users, where they can buy or sell their used study materials on the same platform. E-Sale-Buy Portal for Technical Books is an initiative towards one-stop E-commerce search engine that helps the users to query over thousands of books with respect to the different courses undertaken by them. Hence, simplifying the tedious task of finding the required study material in physical market. This is also an attempt to bring the different stakeholders involved in this business in order to deliver better service to the end user including publishers and logistics. The proposed work also aims to setup an intelligent book recommendation system that allows the user to find out the opinions about the book based on reviews provided in other merchant websites. This helps the end user to come up with conclusions regarding the quality of the study material that is available in the portal.

Section II covers the details of the existing system along with their pros and cons. The overall architecture of the posture detection system is covered in section III. The experimental results and implementation results are discussed in section IV followed by conclusion in section V.

## II. EXISTING SYSTEM

The phenomenal characteristic of human being is to express his views and further represent the extracted view in a suitable and understandable manner. A majority of critical problems arise when the mapping between the human

language and the computer system is to be in sync to make sure the view is expressed in the same way as it is understood. Natural Language Processing (NLP) is the sub domain under Artificial Intelligence which aims at bringing in communication between the computer system and human there by enabling automatic management of data and processing of information. With the tremendous increase in the use of social networks, the generation of data in the form of images, reviews, comments and blogs has also increased drastically over a period of time. Moreover, not all the data generated is related to one particular topic, which makes the task of data segregation very difficult. A wide range of NLP tools like morphological separation, machine translation, recognition of speech, optical characters recognition, text-to-speech systems, sentiment analysis and opinion mining, analysis of discourse are the major ones that are currently used on a wider scale. Computational models are extensively used to bridge in the gap between the human processes and the semantic features used in the computer system. Opinion mining based on review analysis provides the users with the semantic connectivity between the extracted features based on which related a correlation in mapped among the entities.

A detailed analysis on NLP has been covered in Review of Natural Language Processing Research by Erik Cambria [2] marking the introduction of NLP with its focus mainly on the syntax than on the semantics. With the applications of machine learning techniques, semantically driven processes also were included as an important feature of NLP. This was further followed by the First Order Logic (FOL) supporting the syntactic, semantic and the pragmatic expressions which broadened the application areas of NLP. The very recent instance of NLP is the use of computational intelligence techniques where the processing levels similar to that of human brain can be achieved and can be extended to domains like neural networks and fuzzy logic. The paper is concluded by highlighting that the main aim of NLP systems is to develop intelligent systems which have the physical knowledge of how objects behave social knowledge of how people interact, sensory knowledge of how things look and taste, psychological knowledge about the way people think.

In the work Aspect-Oriented Opinion Mining from User Reviews in Croatian by Goran Glavas et. al. [3] aspect-oriented opinion mining has been proposed to identify the features of product aspects based on the opinions expressed in the text. The opinions considered here are in the form of lexicons and are made domain specific to improvise the polarity and ratings of the reviews. This in fact becomes a well advanced supervised approach bringing in a link between the opinions and aspects, to make them feasible enough with improved polarity and rating predictions. But the most difficult task lies in identification of opinionated for undertaking aspect based comparisons and reviews. Furthermore these systems were designed with respect to specific languages and domains which was not acceptable in case of cross domains. The proposed system mainly aimed at identification of opinion expressed about individual product aspects and predicting the overall opinion expressed by a review.

The Internet of Things (IoT) economy is used as the basic entity is upgrading the e-commerce economy like the payment

links, product quality traceability, linking the similar attributes based on their reviews obtained and many more [4]. This link between IoT and e-commerce is much needed as it brings in a coordinated development with the progress in technology, such that the economic aspects are supported with the broadband network connections along with quality traceability. It facilitates in the development of e-commerce by servicing the applications right from the sensors to cloud computing controller to providing a good quality, excellent technology. The services provided further have enhanced the integration of industrialization and informatization based on the demands of the customer. The broad range of e-commerce applications include trading platform, logistics, education and training, consulting, financial, credit and business service industry. IoT also needs the integration of online and offline manufacturers, telecom operators, terminal manufacturers, system integrators and professional software providers.

In the work "The Internet of Things: The Future of Consumer Adoption" authors have defined IoT as the phenomenon of everyday devices connecting to the Internet through tiny embedded sensors and computing power. To enable this the devices are enabled with the power to sense and transit the information online such that consumers all around the globe can have an access and perform analysis on the obtained data which can in turn influence the developing environment. IoT can influence both business-to-business and business-to-consumer based companies [5]. An analysis was carried out to bring in awareness between the people who are unable to understand the benefits posed by smart technology and its benefits in educating the consumers based on the growing market factors. The proposed work also focuses on the important characteristics of IoT like data sharing and the easy-to-use customer experience have made it more strategic, technically powerful bringing in much efficient change management. Though such predominant advantages are currently present, IoT for e-commerce is yet to be made widespread.

In the work "Internet of Things in Logistics - A collaborative report by DHL and Cisco on implications and use cases" for the logistics industry the author has defined IoT as the connection that can be extendable to physical objects as well such that they can send, receive, process and ultimately store the information where future decisions can be taken based on the analysis done [6]. IoT is viewed as the collection of consumer - oriented devices, embedded technologies and apps which is bridging in the gap between the digital and physical world. Some of the key features of IoT to be followed for the successful development of the application are: use of tags which act as unique identifiers for the clear and standardized approach, interoperability to bring in exchange of information between the sensors, interoperable in heterogeneous environment and having a clear focus on reference architecture.

### III. E-BUY-SALE PORTAL

E-Buy-Sale Portal for Technical Books is an initiative to bring most of all the stakeholders and their functionalities in a single system. Hence improving the business, utilizing the various network and computing technologies that have come

up. Figure 1 represented below gives a schematic overview of the entire functioning of the system.

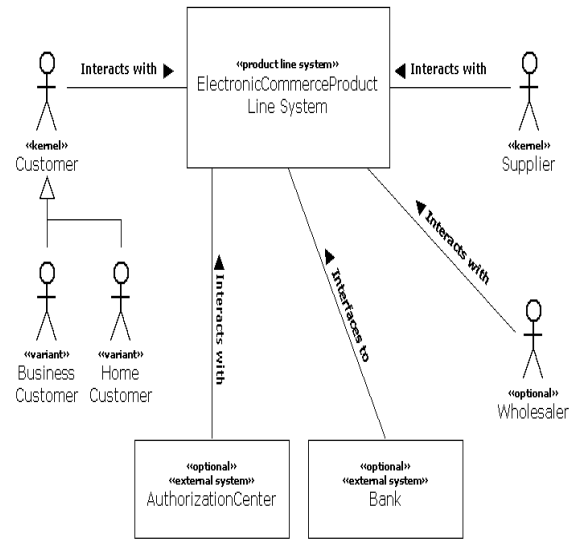


Fig 1: Schematic representation of the proposed system.

For better functioning of the system, the proposed system is decomposed into several modules to simplify the overall development of the system. The basic modules identified are: end user, publisher and logistics.

#### A. End User Module

The most important participant of any E-commerce portal is its consumer/ End user. We have tried to create an exclusive module for the end users, which can be accessed by them with the help of their email id and password. End user has the facility to query the study material they need and add them to wish list or place order. Once the order is placed, the end user can track the proceedings of delivery of the product. Implementation of this module is done using programming languages like PHP. Interface is developed utilizing HTML and CSS. And MySQL is used to maintain information about the customers and the study materials. One of the unique features that our portal provides our clients is the Intelligent Book Recommendation System.

The uniqueness of the user interface of the E-Buy-Sale Portal, when compared to the one facilitated by other merchant websites, lies in the efficient book recommendation system. Implementation of this system is brought about by scraping the reviews regarding the product from other e-commerce websites and collecting it into a review database or block (this is brought about by using a python library-Beautiful Soup). Once the scraping is done, NLTK (Natural Language Tool Kit) is used to do a sentimental analysis on the reviews collected. A confidence value is computed, that represents the number of positive and negative reviews regarding the product. This value is displayed on the interface, helping the customer to draw a better conclusion regarding the study material.

#### B. Publisher Module

Publisher is an inevitable participant of the book vending system. The module for the publisher allows them to maintain

an efficient Bookshelf, with several functionalities like updating stock for each book published by them, and adding new books into the bookshelf with their descriptions like book name, author, ISBN etc. It also allows the publisher to remove the old versions of the book that are no longer published or not used by the readers.

There can be n number of publisher in participating in the portal, each one of whom can access their bookshelf with a valid email id and password. This module is implemented by using MySQL as database (to maintains book details like name, ISBN etc.), and PHP to control the working of the bookshelf.

C. Logistics module

Delivery of services or products is an integral part of an ecommerce. And this can be managed by the logistics module incorporated in the portal. The portal can have many distribution managers, each of whom will be responsible for distributions for a set of locations. The logistics personal can access their interface by logging in with a valid email id and password. Once the log in is done, the manager can select the locations from the select list and submit. The logistics module returns an optimised route which can be utilised by the personal to deliver the product.

This module is implemented using Google Maps API and application of a TSP (Travelling Salesman Problem algorithm) variant.

IV. EXPERIMENTAL RESULTS

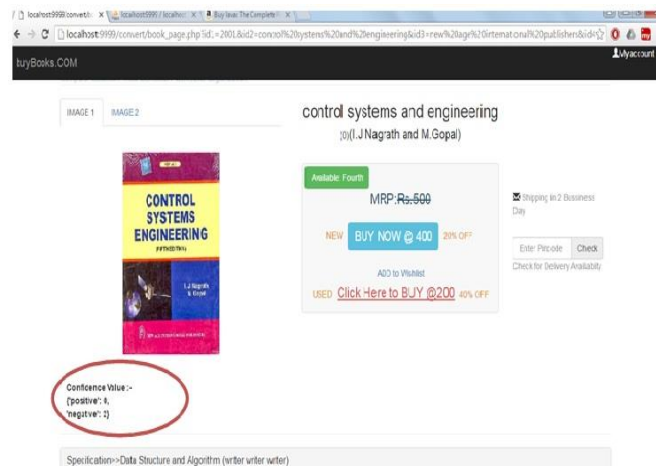


Fig 2: Intelligent Book Recommendation System.

The description of the study material is represented in the interface shown in Fig 2. This view also provides confidence value for each book with the number of positive and negative reviews regarding the respective study material. This is computed by working out a review analysis on the comments in the merchant websites.

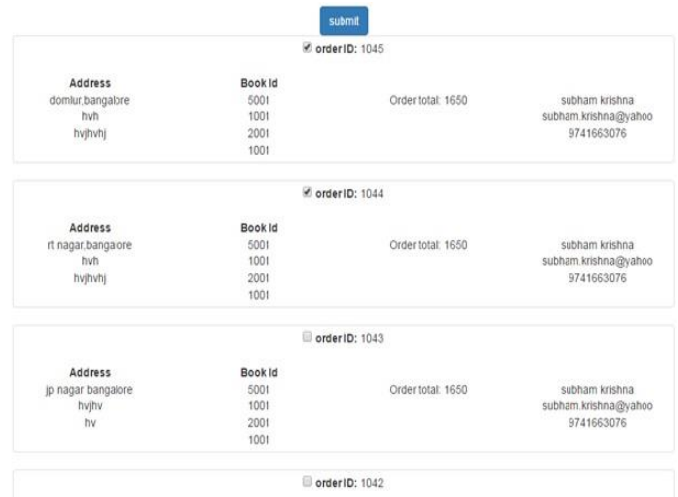


Fig 3: Logistics Interface

There can be n number of distribution managers linked to the portal, each one of which is responsible for the delivery of product at specific locations. The manager can log in to the portal with a valid email id and password. This results in a interface as shown in Fig 3 with the list of locations and the orders pending and are yet to be delivered.

The distribution manager can select the suitable locations from the list using the checkbox. Once the location is submitted, the module provides an Optimised Route that can be used to perform the delivery of goods as shown in Fig 4.

OPTIMIZED ROUTE

- Jaya Nagar, Bengaluru, Karnataka 560041, India => J P Nagar, Bengaluru, Karnataka 560078, India
- J P Nagar, Bengaluru, Karnataka 560078, India => SP Road, Bengaluru, Karnataka 560002, India
- SP Road, Bengaluru, Karnataka 560002, India => RT Nagar, Bengaluru, Karnataka 560032, India
- RT Nagar, Bengaluru, Karnataka 560032, India => Domlur, Bengaluru, Karnataka 560071, India
- Domlur, Bengaluru, Karnataka 560071, India => Jaya Nagar, Bengaluru, Karnataka 560041, India

Fig 4: Optimised route for delivery of study material

V.CONCLUSION

Information technology is the key factor for the development of post-industrial society. The businesses in this modern era are networked and use information technology to survive in a highly competitive environment. The growing phenomenon of globalization, liberalization and privatization has been immensely influencing the higher education commerce in particular. The technological revolution has further provided new dimensions.

E-commerce has been gaining importance all over the world. E-Commerce is associated with buying and selling of information, products and services over computer

communication networks. E-Commerce helps to conduct traditional commerce through new ways of transferring and processing information. Since, it is information which is at the heart of any commercial activity. Information is electronically transferred from computer to computer, in an automated way. E-Buy-Sale Portal for Technical Books aims to bring in all these computing and network technologies into an ecommerce system that deals with study materials. The proposed work incorporates unique features like sentimental analysis, book pool systems etc. Hence making the online shopping activities of the end users much more efficient.

The main aim here is to deliver books to customers in the shortest possible time and in low cost. Intelligent book recommendation systems results in end user's satisfaction with their choice of books, today's businesses must always strive to create the next best thing according to consumer's need, because consumers continue to desire their products and services to continuously be better, faster and cheaper.

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