

Mobile Commerce: Big Source of Big Data

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Abstract - Mobile Commerce is the electronic commerce conducted on hand held devices such as mobile phones, PDAs with the use of internet. Mobile Commerce has different applications depending on the task it performs and Mobile Apps are developed for these applications. People use Mobile Apps to do internet banking, shopping, bill payment, money transfer, ticket booking because of ubiquitous property of mobile devices, introduction of advanced technology smart phones, user friendly mobile applications (Mobile Apps) and reduced charges of mobile data. Mobile advertising, Mobile inventory management, Product locating and shopping, Mobile Auction are also conducted using mobile Apps [2]. State Bank Anywhere, iMobile, AXIS Bank, Myntra, OLX, Paytm are some examples of Mobile Apps.

Mobile commerce applications are generating large volume of data continuously which can be unstructured; semi structured, structured and can be processed to find the hidden information. This data is called as big data. Mobile commerce and data generated is the big and newest opportunity for both retailers and marketers. With mobile commerce, companies now have much more consumer data than ever before and they have started to take advantage of it [9]. Companies are using big data techniques to examine large data sets to find hidden patterns, trends in market, customer's choice and other useful business information which is advantageous to make more knowledgeable business decisions.

Index Terms - Mobile Commerce, Big data, Mobile App, hidden pattern.

I. INTRODUCTION

Mobile Commerce is the electronic commerce conducted on hand held devices such as mobile phones, PDAs with the use of internet. People are changing their choice from desktop computers to mobile devices to conduct net banking, online shopping, bill payment, money transfer, ticket booking because of ubiquitous property of mobile devices, introduction of advanced technology smart phones, user friendly mobile applications, reduced charges of mobile data. The number of mobile internet subscribers is expected to reach 315 million by 2017; estimates IAMAI-KPMG report [1].

Big data is unstructured; semi structured and structured data generated in tremendous volume continuously which can be processed to find the hidden information. There were over 1.8 zettabytes of data created in 2011. Data is a big opportunity for both merchants and business persons, and mobile commerce is the newest data opportunity. With mobile commerce, companies now have much more consumer data than ever before and they have started to take advantage of it. Companies needs to

maintain consumer trust, keep their message relevant, and focus on the big goal to use this data and pick these business opportunities [9].

Mobile commerce is a big source of big data. It has different applications depending on the task it performs. Financial applications include mobile banking, Mobile Payments for utility bills. In Mobile advertising user specific and location sensitive advertisements are sent to the user. Mobile inventory management is location tracking of goods, boxes and people. Product locating and shopping includes locating and ordering certain items from mobile device. Mobile Auction is service for customers to buy or sell

certain items using mobile Apps [2]. Number of financial institutes and banks has developed mobile applications to conduct money transfer, to use banking services, utility bill payments. ICICI direct, State Bank Anywhere, iMobile, AXIS Bank are some examples of Mobile Banking Applications. Users can view the bank statements, transfer money, pay utility bills, pay premium of loans, and make fixed deposits using these mobile Apps. Different companies, shops send advertising messages regarding offers on food products, clothing to their customers on the basis of their residential address if it is near to the shops location. Online shopping Apps such as Myntra, Jabong, Paytm, Amazon are developed for on line shopping of cloths, accessories, jewelry. OLX is a mobile App which is used to buy or sell the products.

Millions of people are using Mobile commerce applications as per their requirements as a result enormous amount of data is generated daily. People do online shopping. When a user login into any online shopping application, he enters his user name and password. Then OTP is generated. The user enters OTP and do successful login. The user searches the products, places the order and logout the application. In this process data like OTP, searched products, date and time of searching and placing order, wish list of products, mode of payment such as credit/debit cards, net banking, e-wallets or cash on delivery and the data regarding payment details is generated for that user. Such type of information is generated for millions of user continuously.

The voluminous data generated in Mobile Commerce is a big opportunity for business persons to gain knowledge regarding customers' choice, their behavior, market trends and use this information to enhance their business and the

profit. Different Big data analysis techniques are used to retrieve this information.

II. MOBILE COMMERCE AND BIG DATA

Reduced mobile internet charges, ease of use, ubiquitous working, technology advancement of smart phones and transformation of mobile device into mobile wallets made tremendous increase in mobile subscribers and mobile commerce businesses. People can search and compare different product, get live NEWS, do payment, buy products anytime anywhere using mobile internet, mobile Apps which are made available by the corresponding companies and therefore there is tremendous growth in mobile commerce business. Fig1. shows Worldwide App Store downloads for different mobile applications. Downloads, earnings, and time spent in Apps all grew by double digits during 2016, according to a report by market researcher App Annie. Time spent in Apps grew more than 20 per cent to nearly 900 billion hours in 2016, according to the year-end report. During the year, India surpassed the U.S. as the No. 1 country by Google Play downloads. India grew from more than 3.5 billion downloads in 2015 to more than 6 billion last year. The country's smart phone penetration stands at only 30 per cent, so there is a great chance for more growth [6]. Mobile commerce involves not only Mobile Payments but also content purchase and delivery, location based services, Information services, mobile marketing and advertising as described below.

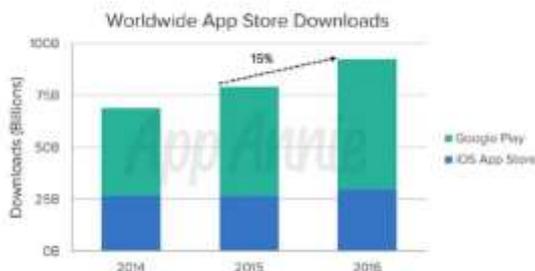


Fig. 1 Worldwide App Store Downloads

A. Mobile Payment

Mobile Payments are the major source of big data. Many financial institutes and banks developed mobile applications for doing financial transactions. LICMobile of LIC, State Bank Anywhere of SBI, iMobile of ICICI, AXIS bank are some examples of Mobile Apps. Total transactions cleared through cheque in FY 2015 (April 2014 to March 2015) is INR 85 lakh crore (US\$1.33 Trillion) and cashless transactions through credit card, debit card, NEFT, and online wallets is INR 92 lakh crore (US\$1.43 Trillion). The total transaction amount in India exclusive of cash transactions reached \$2.76 Trillion in FY15 as shown in Fig.2. In FY 2015, a cashless transaction through mobile banking was Rs. 1 lakh crore which was not huge but it is the fastest growing payment alternative. These low numbers are expected as only 1 million customers are transacting using mobile wallets. However, the numbers will grow as it

is expected to reach 100 million customers using mobile wallet in the country during the next 5 years as smart phone users in India will grow with time using better connectivity option. During these online transactions 50000 GB data is generated per second. Consider a customer using Mobile App for shopping. New customers have to register the App. The customer writes user name and password. OTP is generated and sent to the customer through SMS for user and device authentication. The customer submits the OTP and do successful login. In this login process, data such as user name, password, OTP, mobile number, process ID, time of login, request time for login and response time of the server for successful login, number of attempts to login, is generated. After successful login user search products, add products to the cart and wish list, remove items from cart. In this process data such as user name, products searched, the search criteria such as discount, brands, colors, product size, delivery time is generated. Customer proceeds for checkout. In Checkout process data such as number of products, total amount, shipping address, mode of payment such as cash on delivery, credit/debit cards, net banking, mobile wallets, card details such as card number, type of card such as VISA PLATINUM, Maestro, RuPay, name on card, CVV, Expiry date, amount to be paid, OTP for transaction, transaction ID is generated.



Fig. 2 Total Paper Vs. Digital Transactions in India FY 2015

Online shopping using Mobile Apps involves Mobile Payment. There are many more examples of Mobile Payments. Railway Ticket, Air tickets, Movie tickets reservation using Mobile App, Utility Bill Payments, transfer money from one bank account to other bank account, do e-fix deposits, Recurrence Deposits, close Fix Deposits using Banks' Mobile App, transfer money from Mobile Wallet of one user to Mobile Wallet of other user, are examples of Mobile Payment. Billions of customers do Mobile Payments and tremendous amount of data is generated per day [4].

B. Content Purchase and Delivery

Mobile content purchase and delivery mainly consists of the sale of ring-tones, wallpapers, and games for mobile phones. The convergence of mobile phones, portable audio players, and video players into a single device is increasing the purchase and delivery of full-length music tracks and video. The download speed of 4G mobile internet make it possible to buy a movie on a mobile device in a couple of seconds. Gaming accounts for 75 percent of overall revenue

for Apps on iOS and 90 percent of revenue on Google Play. Pokémon Go generated \$950 million in revenue in 2016 and also attracted new users. Consider customer playing a mobile game. The customer downloads the game and play. In this process user name, password, mobile number, internet data required to download the game, time of download, location of the customer such data is generated.

C. Location Based Services

Availability of GPS and smart phones, Location-Based Services (LBS) give customers real time information. The location of the mobile phone of customer is an important part of information used during mobile commerce transactions. Location specific payment portals, mapping, navigation, travel & tourism, retail offers are some examples of Location Based Services. Knowledge of location of the customers is useful for location based services such as local discount offers, local weather, tracking and monitoring the people. The key assumption behind the success of LBS is that location is most often linked to a specific intent to buy or research products and services at a particular instant of time. The effectiveness of LBS for business is reflected with a desired \$10 billion in earnings generated from consumers by FY 2016. Fig.3. demonstrates location based service users in the FY 2011-2016. 20% of the world's mobile users use LBS, and 62% of remaining non-users of LBS want to use it in the future [7].

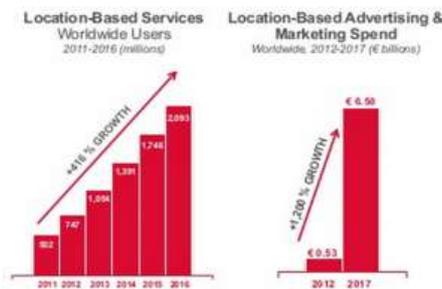


Fig.3. Location Based Services Users

These figures suggest that customers have recognized the need of Location Based Services. Consider Location Based Service navigation. At each instance data such as current location, GPS data, directions, traffic intensity, and distance remained to reach destination is generated. This data is generated for billions of users at the same instance of time.

D. Information Services

A wide variety of information services can be delivered to mobile phone users in much the same way as it is delivered to PCs. These services include NEWS, Stock quotes, Sports scores, Financial records, Traffic reporting, Emergency Alerts. Mobile applications are available to download these information services. MT, TOI, MoneyControl, Weather are some examples of information services. Information service such as TOI sends the users current social, financial, government, weather, entertainment messages. Data regarding NEWS, subscribed users is generated at each instance of time.

E. Mobile Marketing and Advertising

In Mobile Marketing advertising messages are sent to the mobile devices. Companies have noticed better response from mobile marketing than traditional marketing because of instant decision making of the customers and the Mobile Apps which made instant reach of advertising and discount coupons to the customers. The customers can search and buy the products without interrupting their current activity. Considering one example of a user login in the Facebook account, when he reads the messages and posts of the Facebook, he finds advertises regarding cloths and offers or the advertises regarding the products in his wish list he prepared on another online shopping account. Without disturbing his Facebook activity he can view the products, compare and buy the products. This instant and direct messaging mobile marketing and advertising have noticed a distinguishable growth in the business profit.

III. DATA ANALYSIS FOR BUSINESS ENHANCEMENT

Big data is a data which have Volume, Velocity and Variety. This data is increasing in a large volume and with high velocity and cannot be processed using traditional database management system. Mobile commerce is a big source of big data. The large data sets produced in Mobile commerce are a big opportunity for business persons to find hidden information regarding customers' interest, their behavior and use this information to enhance the business profit.

Big data analytics is the process in which large data sets are examined and hidden patterns, current trends in market, customer's priority and other useful business information is uncovered. Big data analytics help companies to make more knowledgeable business decisions by enabling data scientists, predictive modelers and other analytics professionals to analyze large volumes of data [10].

There are some completed or ongoing projects at WAYNE STATE UNIVERSITY that are about developing new big data methods and techniques as discussed below.

"Probabilistic Graphical Modeling Research" is about developing probabilistic models to understand complex domains with large amounts of uncertainty. Developed techniques are applied to solve real world problems such as heterogeneous data integration, imbalanced data learning, and big data learning. In the project titled "Mining Twitter data: From content to connections" at WAYNE STATE UNIVERSITY streaming data is collected from the Twitter's firehose API. About 5GB of data and about 19 million tweets are obtained each day. For "big and growing" data complete distributed databases are established that can perform parallel queries through the API. The system is developed to retrieve and analyze a wide array of information from the Twitter data such as retweet network, follower and friend's network, Twitter Lists, Geo-location based statistics, Topic modeling on Tweets. Novel framework "Location Centric Word Co-occurrence" is developed to identify and summarize tweets that are specific to a particular Geo-graphical location. In the proposed system "a Low-rank Approximation-based Spectral (LAS)

clustering for big data analytics” , by integrating low-rank matrix approximations the approximations to the affinity matrix and its subspace, as well as those for the Laplacian matrix and the Laplacian subspace, great computational and spatial efficiency for processing big data is gained [11].

Big data analytics is advantageous for business persons to enhance the profit of the business. The analytical findings can lead to more successful marketing, new revenue opportunities, better customer service, improved operational efficiency, competitive advantages over rival organizations and other business benefits. A top challenge facing businesses is determining how to extract value from their data. Fig.4 illustrates the Data Analysis Process [12]. Following are the steps for data analysis process.

- a) Process and Clean Data
- b) Explore and Visualize Data
- c) Data Mine
- d) Build Model
- e) Generate Results and Optimize
- f) Validate Results

There is a huge amount of data available in the industry and this data is of no use until it is converted into useful information. It is necessary to analyze this voluminous data and extract useful information from it. It is also important to verify if the data matches the business goals. There are a number of methods that can be used to assign or fill in missing values such as mean interpolation, Kalman filter and ARMA. The quality of your data greatly affects analysis results. So data processing and cleaning is very necessary and takes 70-90 percent of data analysis project time.

After processing and cleaning the data, it is explored and visually examined for patterns, trends and clusters. At this stage relationships and hypothesis are built according to the findings. There are various methods to make pattern recognition easy which includes clustering K-Means, hierarchical clustering, market basket analysis, Kohonen Self-Organizing maps for visualization, principal component analysis, factor analysis, and multi-dimensional scaling.

There must be a wide range of models that provide different perspectives of the data. Decision trees, Naïve Bayes classifier, neural networks, ARIMA, regressions, SVM, and discriminant analysis are some models. It is very important to understand the advantages and limitations of every algorithm. It is very important to document the assumptions and results clearly. The purpose of this big data analysis process is to produce information and results that lead to valuable business decisions which should match the initial business objective.



Fig. 4 Data Analysis Process

IV. CONCLUSION

Mobile commerce is E-commerce conducted on mobile devices. Ubiquitous working, reduced mobile internet charges, advanced technology smart phones and availability of Mobile Apps for Mobile commerce services have converted mobile devices into mobile wallets and there is countable increase in mobile and mobile internet subscribers. Mobile commerce businesses are generating enormous data continuously. This data is big data and new opportunity for business persons. This data can be processed to find hidden patterns, trends, customers' behavior which can help business persons to find customers' choice and market trends which in turn is helpful to enhance business and the profit. There is a big challenge for Mobile commerce businesses to find a way to mine the available data to find the patterns and conclusion to achieve business goals.

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