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Editorial Board

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Director's Message

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Director, SITM

Prayukti, the student journal of SITM, is a journal driven by the students for the students. The purpose of the journal is to get students well acquainted with the latest trends and technologies in the industries of the ICT domain. All the articles are written and reviewed by the students of SITM. In doing so, the writers of the articles get to do a detailed research of the subject in question and get an early exposure in writing white papers and articles. This exposure is crucial for the students in terms of their career. Every year students from both academic years contribute to the journal with their articles, out of which a select few which the reviewers and the faculty deem exceptional are published. The faculty of SITM guides the students throughout the process by contributing their valuable experience in the domain of ICT. SITM is not just a teaching institute but a learning institute as well. Through various co-curricular and extra-curricular activities, the Institute constantly strives to boost the knowledge and skill sets of the students. Through similar activities, conferences, seminars and live projects the students get the confidence to face the corporate world even before securing a placement.

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PREFACE

Symbiosis Institute of Telecom Management works towards a notion of developing techno-managers by making the students more technology-centric with a potent mix of managerial skills, enabling them to manage the technological fundamentals of an organization. As a part of a telecom business school, that has broadened the exposure of students in Information and Communication Technology (ICT) domain, it gives us an immense pleasure to release the third edition of Prayukti. The success story of the magazine lies in the joint venture of the team members, students, and the faculties. The magazine contents reflect the current and upcoming ICT trends written by the students but from a business perspective.

Prayukti, an initiative of Symbiosis Institute of Management is derived from a Hindi word 'Prayukti', which means motivation, application, and result. The insights of the trending ICT documented are driven by research and experience. This edition of the magazine comprises of 10 papers. The areas of focus are Virtual Reality, Electric vehicles, BOTNETs in Digital Marketing, Feature phones, Analytics in Telecom, Heterogeneous Networks and Small Cells, Chatbots, Green wireless Telecommunication, Cybercrime and Digital twin. On behalf of the magazine members, we would like to seek this opportunity to acknowledge the professors for being a great pillar of support and guidance and to the students who have directly or indirectly contributed to the magazine. We would like to take any advice or suggestion that could drive us more smoothly with the future editions.

TABLE OF CONTENTS

Analytics in Telecom - Changing Business Model from Red Ocean to Blue Ocean

Saurabh Yadav, Megha Vaish

Abstract

Telecom giants collect lots of data regularly which can give deeper insights and will drive smart decisions if utilized effectively by proper mining and critical analysis of both structured and unstructured data. Today, Telecom industry customer base is not only large, but it is also evolving and changing at a rapid pace. On top of this, there is Red Ocean in the industry making it challenging and dynamic for any operator to sustain. Hence it is important for operators to take decisions based on extensive data analytics for effective utilization of resources. This study/paper is an attempt to explain in brief how analytics can be applied in reducing customer churn, fraud and security breaches, improving Network optimization and managing unstructured data. This paper will also help readers to understand the fraud and security breach faced in the telecom industry. It further illustrates the tools & techniques used for data analysis.

Keywords

Predictive analytics, prescriptive analytics, social media analytics, forecasting, customizing plans, text analytics, Call Data Record (CDR), ARPU, Blue ocean, Red ocean, congestion, Regression.

Introduction

Telecommunication industry in India is very dynamic and competitive in the world which can easily be understood by the fall of 4 operators (Tata Teleservices, Telenor, Reliance, and Aircel), because of the rise of R-Jio who entered by creating an uncontested market based on blue ocean strategy. Indian telecommunications market with a subscriber base of 1185.88 million (TRAI, 2018) is the second largest after China. There are currently 5 telecom service providers in India with a teledensity of 91.61% (TRAI, 2018), out of which 1,162.47million customer are wireless subscriber (2G, 3G, 4G) and 23.41 million as wireline subscriber (TRAI, 2018).

The 4G Data usage on Indian telecom operator's networks has doubled in six months to 3.7 million gigabytes. The government has also taken various initiatives such as Digital Literacy Scheme for rural India, launching of payments banks and UPI (Unified payment interface) like BHIM. New spectrum trading rules have been introduced which led to improving service quality and enhanced speeds by supporting consolidation. The Urban teledensity stands at 167.72% while for rural it's 56.54% as of Nov 2017 (TRAI, 2018). The rural sector is still untapped and there lie lots of opportunities for operators if they effectively manage infrastructure, it can provide them a new uncontested market or a blue ocean, as the rural customer's demand is increasing day-by-day (IBEF, 2018).

The major investment in telecom goes into licensing, spectrum and infrastructure, network cost, but after huge investments, operators are still running in losses, because they haven't utilized their resources efficiently. Today telecom is not just about calling and data, it's about user experience and delights the services are offerings to an end user. The telecom operators are facing the problem of increasing customer churn and innovative offerings by existing and new competitors. It is a known fact that the operator's revenues from voice services are stagnating, as users are more relying on OTT apps rather than the existing ones provided by operators which simply means the telecom market is moving to a new uncontested market of Blue Ocean where new services based on user experience can change the whole scenario. It is therefore required by the firm to take decisions using extensive research, to maximize revenue and profits (COMMUNICATIONS TODAY, 2016). The telecom operators generate very large volumes of data on daily basis related to network operations, applications, customers, call processing, data usage, services being offered etc. This large dataset generated has the capability to give valuable and deep insight which can help in finding loopholes in the current process giving better decisions. An increase in devices will lead to more fraud cases and loss of revenue for operators, this problem can be overcome by designing a system based on big data to make decisions and mitigate the risk involved. Big data has the potential to create new revenue streams for operators by converting risk into opportunities and providing the unique experience to customers (Bhandari, 2016).

With changing paradigm, mere description or descriptive analytics is not much efficient as per changing market

demand as it can't provide deep insight of data to operators. In such scenario, predictive and prescriptive analytics plays a major role. This can provide system high valued customers which are likely to repeat their orders and accordingly give those customers offers and other additional services which they are most likely to have. Operators can combine data from different platforms like social media, government portals, billing information and purchases, data record, call record to produce patterns in data. With the help of big data and prescriptive analytics techniques customers can be distinguished into different target markets and as per the identified market segment services and products should be offered, which they are most likely to buy. Big data provides operators to capture most important information of customer like usage pattern, spending pattern, services used and feedback, a brand used, brand preferred, application most used, technology, average revenue, time spent on a particular website, download content, current location, last location, most visited location. If this information used effectively it can give valuable insights to the operators (Exastax, 2017).

Some of the major challenges and how can they can be understood by analytics:

Customer Churn

Churn within the telecommunication business is inevitable and pricy. "Churn" in the telecom industry is the share of subscribers moving from a selected service (3G, 4G) to another service or operator. Telecom Operators today have an average churn rate of 1.9 to 2 percent month on month and an average annual churn rate of 10 to 60% which might have an effect on the company's overall growth (kanniappan, 2014). Customer churn reduces profitability and increases marketing and re-acquisition expenses. Customer retention is important because when a customer leaves, the operators do not only lose the future revenue from this customer but also the resources spent to acquire the customer. To better understand customer churn factors and develop strategies to reduce it, operators need to develop an in-house approach to analytics as using outsourced services, reduces flexibility and increases the time to react quickly and increases the risk of losing customers to competitors (Sahai, n.d.). In churn analysis as the age of the customer's equipment increase, churn rate increases. And as the contract increase churn rate drops steadily means, customers are satisfied with provider and services being offered (kapoor, 2017), such findings can really help operators to develop a strategy before launching any product or service.

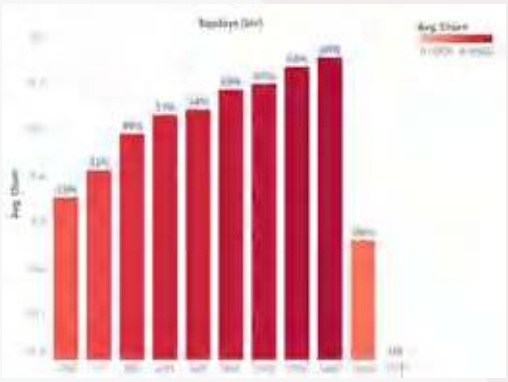

Fig 1. Churn Rate Increases with increase in equipment age

Fig 2. As Contract increase, churn rate drops

Analytics can help to categorize customers based on the ARPU into different segments. This will provide better services and faster response to customer's query. Integrating data from a wide variety of sources and analyzing data using advanced statistical models, to identify customers with the most likely risk of churning, and accordingly, Operators can take timely action by providing offers and improving the overall customer experience. Using automatic churn prediction mechanism to react quickly when a customer patterns are indicating a high probability of churn. Using predictive churn modelling techniques marketing departments can better target recruitment campaigns (Reply, 2018). Telecom companies use TRIPLE PAY services which is again becoming a red ocean, in TRIPLE Pay if few more services can be added like Entertainment, Education and regional information etc. Instead of having different apps, integrating services will give enhanced user delight and experience. Identifying gold customers by applying analytic techniques and give them a special privilege, will certainly increase customer lifetime value and reduce churn rate. Creating a strong CRM system in build with big data analytics and KPIs will lead to high customer satisfaction and experience (Hughes, 2017). (CFCA, 2015)

Fraud and Security Breaches

Fraud in Telecommunications is consequently an extensive subject. Out of the different types of fraud superimposed fraud and subscription fraud has done the most damage to the industry. Operators admit of 1% of the revenue through leakage, and for some, it is up to 10%, (KPMG Survey). As per the annual survey of 74 operators, the global telecom industry is confronting the revenue leakage of about $40 billion a year. Almost 50 million customer records have been lost through Cyber-attacks in the past 10 years. For telecom operators it's not only the frequency and number of records that are breached, it's also the type of data that can be lost like customer data, including financial information, behavioral data, usage, and services subscribed. Due to the security breaches and telecommunications fraud, operators lost around $38.1 billion in 2015 (CFCA, 2015). Billing systems have been highlighted as the most vulnerable to revenue leakage, so telecom operators are developing more effective automated revenue assurance tools, but it's still not sufficient as it can easily be hacked due to lack of security. The traditional way to detect fraud using Call Detail Records (CDRs) are not much powerful and only effective once fraud has occurred (S, 2017)

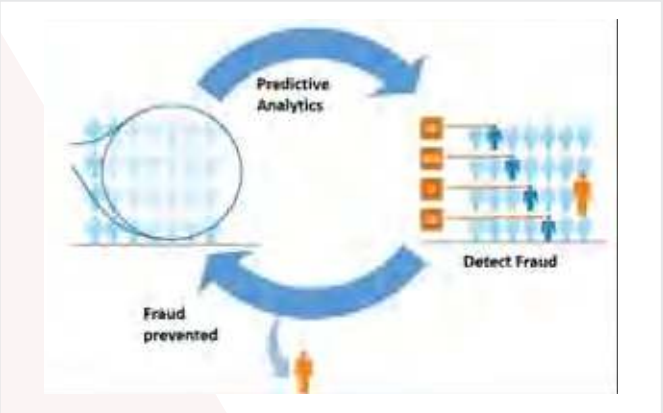

Fig 3. Predictive analytics in Fraud prevention

To detect fraud in real time operators can start by combining data into one vast data lake that can be tapped to provide real-time information about anomalous behavior to point fraud in real time. Using Algorithms based on regression technique to design predictive model for detecting fraud in real time. A predictive analytics model can be built using network data, billing data, customer data and payments data to identify the pattern and predict the likelihood of potential fraud in the future. Using predictive analytics technique, large data oceans can be analyzed and bring insights, draw patterns, predict emerging patterns, and assist with a use case to prevent frauds. The faster a fraud is detected the faster it can be stopped. Unsupervised machine learning and data lakes can help you identify new and old types of frauds and helps in predicting critical situation, which can be avoided by taking pre-emptive actions. Continuous analysis of streaming data can point out the outliers more effectively, identify crime rings and even pre-empt large attacks. Fraud prevention increases customer loyalty, customer satisfaction, and customer retention thus giving the competitive advantage to operators (CXOtoday, 2017).

Network planning and optimization

Telecom operation requires considerable capex and opex which includes establishing and maintaining both Passive and Active Infrastructure on a massive scale. Unprecedented growth in mobile data traffic is propelling the congestion on the network and it is almost impossible to deliver superior service quality with existing network capabilities. Operators can overcome these challenges by properly utilizing advanced analytics to enhance capacity planning, support traffic management, and streamline the data flow (Communications Today, 2017). The next-generation network can be a good solution to overcome network congestion but they are very much costly and also integrating and managing network infrastructure is difficult with existing skill set. So in such scenario deploying advanced analytical solutions can efficiently and effectively manage and optimize network planning (Towster, 2016).

Fig 4. Big data and Network optimization

Advanced analytics capabilities can integrate information from multiple sources and support better capacity planning and traffic management. Analytics can improve network congestion, service consumption, and routing and provides real-time insights into network traffic. This will help CSPs to effectively plan network capacity and monetize the network traffic by gaining actionable insights in real time. Data analytics can provide deep insights of usage, network logs, hardware maintenance, peak load analysis, busy

hour and near real-time analysis which will make any network optimized and efficient to handle maximum capacity giving more revenue and incur lesser operating expenses. By combining customer data obtained from detailed records, app logs, social posts, call center data and brand insights into one source of information to derive insights which will be used to predict network loads and accordingly action will be taken to offset the congestion. Enabling real-time data analysis reduces the burden on IT services, simplify data wrangling process, and streamline data flow which saves time, resources, and provides the level of network optimization its subscribers increasingly require (Schaefer, 2017).

Increasing unstructured data

Mobile data traffic is continuously increasing and in the coming years it will increase with more pace. It is said by 2022, traffic generated from a smartphone will increase by 10 times and it is estimated that mobile data traffic is expected to grow by CAGR of 47%. This growth of data traffic is supported by the development of telecom infrastructure, availability of smartphones, consumer migration to higher speeds and growth of OTT services. With increasing amount of data, storage is the main problem for operators and what to do with this data, as most of this data is unstructured which is not possible for operators to get any useful insight without using advanced analytics technique or big data analytics. In today's scenario, around 90% data is unstructured and only 10% is structured. This 10% of data consist of CRDs, DDRs, Network data, and Subscriber data, which can easily be analyzed. While the other 90% which is not yet utilized properly. This includes Content from the social stream, Blogs, tweets, comments, ratings, views, images, videos, traditional web content such as news articles, product information, and simple corporate informational web pages. (ERICSSON, n.d.)

All the unstructured and semi-structured sources become valuable information when with the use of big data to generate a pattern among the data points. From unstructured data meanings that can be derived, includes identifying issues, market trends, consumer behavior, liking, disliking, sentiments, customer likely to churn, switching patterns, loyalty, and the right time for selling. For unstructured data, social media analytics, text analytics, natural language processing, Sentiment analysis can be used for better insights and decision making. Through social media analytics, organizations can mine and decipher vast amounts of data from various social media platforms to discover customer sentiment about various brands, trends, and the issues customers' face. By augmenting social media analytics with predictive analytics organizations can more accurately forecast customer needs, brand awareness, market trends, consumer preferences, and spending patterns, monitoring insights from social media conversations, buying behavior, anticipate issues before they can damage the business's reputation, and further mapping with their competitors. Sentiment analysis automatically categorizes data under positive, negative and neutral sentiment using advanced text analysis and natural language processing expressed in conversations from various feeds on social media (Banga, 2017).

Fig 5. Text Analytics – Themes (Negatives and Positives)

Advanced deep text analytic techniques can be used to identify the common negative themes discussed on social media. The image above shows most common positive and negative themes present in mentions for service providers. The top negative theme from the above analysis for operators is their prepaid network and phone bills. These type of analysis can bring deep insight to operators and help them to take corrective action to engage their customers with positive services (Banga, 2017).

Tools and Techniques

Based on the usage, different techniques and tools can be used for proper analysis of data. Descriptive analytics techniques are association, clustering, and summarization which requires use of tools like IBM Cognos, SAP BI, Excel, Dashboards but mere describing data is not sufficient for deep analysis, for which advance techniques should be used like regression, classification, Time-series analysis. For predictive analytics R, IBM SPSS, Weka, SAP HANA, SAS tools can be used for deeper insights of data. For more advanced analytics prescriptive techniques should be used to mitigate the risk involved and shows the implication of each decision. Various application of prescriptive analytics is Natural Language Processing (NLP), Image Processing, Machine Learning, and Applied Statistic. Various visualizations tools are also available in the market like Tableau, Power BI, Alteryx, chart.js for finding patterns and visualizing data.

Conclusion

Thus with the use of analytics techniques, operators can easily find the loophole in existing process and provide them a chance to focus on new ways of offering services to enter in a new uncontested market. Based on the research done we can conclude that customer churn reduces if the contract term is increased, Quality service is provided. Fraud can be easily detected by outlier analysis. Network optimization can be achieved by applying real-time analytics to IT services which reduce the burden on networks. Text analytics, Social media analytics can easily read the people voice and new trends which can help operators to take decisions while launching new services.

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Megha Vaish

Challenges faced by industries towards the mainstream adoption of Virtual Reality

Sakshi Mishra, Gurpreet Singh Raina

Abstract

Since its advent, adoption of Virtual Reality is growing at an exponential pace. This can be substantiated by a rise in the revenues generated from the sale of hardware and software systems. Initially launched as a gaming mimic, it has now penetrated in sectors such as Education, Healthcare, Retail and Advertising amongst others. Growth has been prevalent in the APAC and US regions. Despite having a widespread presence, VR faces certain hindrances towards mass acceptance. Any technology that uses a network for its functioning is prone to security breaches which are a matter of serious concern for businesses as well as individuals. Likewise, there are Regulatory policies that can have implications for the deployment of VR. This paper focuses many such significant challenges faced by businesses towards the mainstream acceptance of VR. In addition to the above constraints, this study also focusses on the ecosystem requirements including API development, handset providers, and other important structural resources.

Keywords

Virtual Reality, Business Challenges, VR Applications, Security, 5G, VR in Healthcare

Introduction

Virtual reality can be described as the creation of an artificial environment with the help of a software that is presented to the user in such a way that the user suspends belief and accepts it as a real environment. Virtual Reality is one of the most fast-growing technologies across the globe. With a lot of boom in the sale of VR headsets, the growth for VR has been exponential over the past few years. This can be supported by the constant rise in the market growth of VR which is expected to reach $90.8bn by 2020. The year 2016 was tremendous for AR/VR as Ventures rose 300 percent to $2.3 billion. By 2021, the industry is relied upon to drive $108 billion VR has been one of the leading technologies as per Gartner's hype cycle. The market is as yet ruled by enormous players from Samsung (Gear VR), Sony (PlayStation VR), HTC (Vive) and Facebook (Oculus Rift) represented in excess of 60 percent of worldwide VR and AR headset shipments in the second quarter of 2017. As per IDC, worldwide headset shipments grew 25.5 percent Y-O-Y in the Q2, achieving a figure of 2.1 million units. Regardless of developing enthusiasm for increased reality – Apple and Google both discharged an AR advancement pack for their portable stages this year – VR still records for 98 percent of shipments in the AR/VR market.

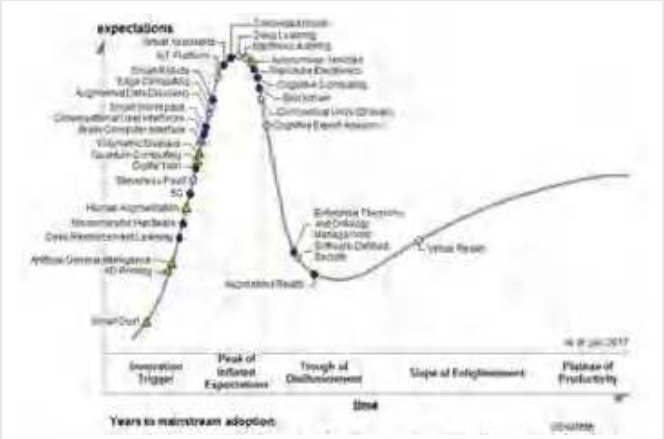

Fig 1. Gartner's Hype Cycle for emerging technologies

VR is slowly beginning to strengthen its roots in the Indian markets as well. There have been around 170+ VR/AR start-ups in India. One of the prominent reasons for this is the onset of 4G services that have hit the market in the year 2016 providing lightning fast internet services across rural as well as urban areas. Facebook, through their school of innovation programme, has co-operated with a Bangalore-based start-up SV.CO to enable Indian undergraduates to learn and assemble items for the upcoming technologies such as Virtual reality (Richer, F., 2017].

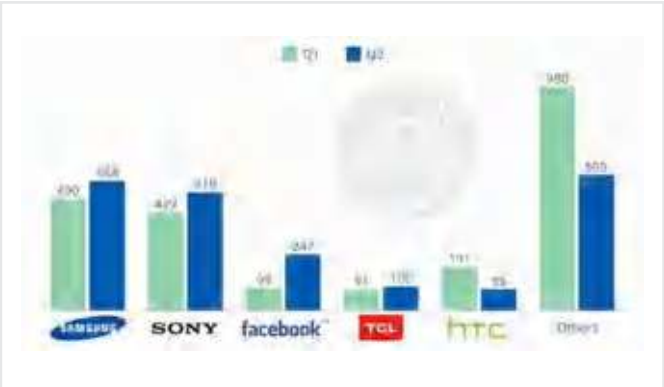

Fig 2. Market Share of VR headset providers

1) Surgery

One of numerous promising components VR conveys to the medicinal field is that of 3D models that specialists can use to prepare and plan activities. These models are made by consolidating MRI's, CAT-sweeps, and ultrasounds. With the aid of such a facility, surgeons claim they are more comfortable in initiating a surgery as they have a confidence that they have already done this previously. Similarly, specialists at Stanford Health Care are utilizing virtual reality innovation amid mind surgery as a visual instrument and to prepare future neurosurgeons previously experimenting with their abilities on genuine patients. As per research by Cambridge University, they seem to have found a use of VR in developing medicine for malignancy: by considering tumors very close in 3D with a VR headset. Where VR is frequently used to plan for surgery, AR can assume a more conspicuous part of the activity table. For instance, an Israeli startup called Augmedics is at present chipping away at expanded reality headsets for specialists performing spinal surgery.

2) Patient Treatment

The most staggering leap forward instances of XR in medicinal services have originated from the utilization cases for tolerant treatment and care. Some of these, similar to Isobar's Common Ground VR, are implemented for caretakers rather than patients. On the front of treatment, the organization MindMaze utilizes VR to treat Parkinson's patients, amputees, and stroke casualties. Their VR arrangements look to help these patients to prepare their mind to invigorate appendage developments. Another such organization utilizing VR is Brain Power, which helps patients with extreme introvertedness. Echo Pixel is an organization that aims to provide a VR based solution by building a 3D system that gives the doctors a 3D view of the patient's internal organs. Their development works similar to the traditional MRI, CT scan but it is virtual (Dj Pangburn, 2015).

3) Medical Training

Six out of ten doctors in the US as of now utilize virtual reality to upgrade their skills in surgical systems. The focal points for using VR is that surgeons acquire higher expertise in performing medical operations. This not only reduces time but also improves the overall success in operations as the margin of error is reduced with the help of such training.
With the help of many organizations, for example, 3D Systems, Level Ex, and Osso VR have made it possible for today's operations to take place in VR operation rooms. Mixes of reality and recreation are surprisingly better. Simulated activities offer the likelihood to rehearse – with no conceivable destructive outcomes for the patients' wellbeing and without troubling the quickly paced framework where patients must be dealt with efficiency (Wytze De Haan, 2017) (Jasoren, 2018).
Preparing or arrangements may be virtual, yet the apparatuses utilized don't need to be Virtual. A company named Immersive Touch, for instance, offers hardware that gives a forced feedback. This means that a surgeon, will feel the operation they perform and they can also feel the impact of a sensitive tissue while operating.

Requirement Analysis

This involves a study of essential requirements for providing a VR solution

1) System Analysis

One of the leading VR headset manufacturers suggested that in order to provide a technically flawless VR experience, a manufacturer/ application provider must have embedded the latest processor (such as Intel), graphics card, Faster RAM(8GB+), an HDMI Output, USB Ports and the latest OS. This is where the cost will play a major role and decide whether these requirements are feasible or not (Fedorov, N., 2015).

2) Content creation

The virtual world's substance offerings are very rare, making enthusiasm for such gadgets gradually die down after the initial phase of excitement. One of the study members recommended that Nintendo and Sega wound up simply because they were sold with various diversions for everybody's tastes. That is precisely what VR engineers ought to do. Obviously, it isn't just an issue for VR recreations; the entire business is influenced. Content creation is a tedious procedure, and evaluating it is over the top for mass clients. An example of content in healthcare would include creating an image of human organs that surgeons can operate on. Needless to say that any discrepancies in the creation of such objects can lead to a disastrous result.

3) Development of an Immersive experience

In order to create an engaging virtual environment optic, a mechanic design must be used. This improves the user experience and provides greater visual comfort. A concept known as Vergence which can be described as the simultaneous movement of a user's

pupils towards or away from one another during focusing has become a real challenge for the optical engineers, who also have to consider size, weight, centre of gravity, and thermal management of the equipment to provide true, wearable comfort. By using Optic Studio and LensMechanix together, optical and mechanical engineers can share complete design data and ensure the quality of the optical performance throughout the entire design cycle (Paul MT,2017) (Mathew Peach, 2018).

4) Quality

It is of utmost importance when we consider 3D modelling. An imperfect description of an object especially in the field of healthcare can lead to catastrophic results and hence must be taken care of.

5) Software requirements

The need for a software will ultimately depend on the need for an application. For instance, Oculus VR released a VR sculpting program called Medium, and this software allows the artist to add to, take away from, and manipulate the shape of 3D objects.

The requirements for a VR based ecosystem includes

1. Smartphones such as Lenovo, ZTE, Moto, Google Pixel etc.
2. Head mounted displays- BaofengMatrix, Oculus Rift, HTC Vive etc.
3. Fast Processors such as Snapdragon835.

Despite the widespread use of Virtual reality, a lot of leading organizations, as well as start-ups, deal with a number of challenges restricting VR from mainstream adoption. These issues vary from technological feasibility to incompatibility and legal issue.

Technical Barriers

1) 3D Modelling

Developing an immersive VR experience requires the best and the latest developments to be included. One of the most critical aspects would include 3D modelling of any particular object. This is extremely important (especially if we consider the medical industry) as incorrect detailing can lead to severe ambiguities in understanding the object. These objects allow users to interact as well as demonstrate features. 3D is much more beneficial than the 2D models as they provide a detailed description of an object and thus they have to be accurate for uses to understand. Another important set of requirements include a high refresh rate and a lower persistent rate. Current players offer a refresh rate of 90 Hz whereas future displays will achieve a rate of 1700 Hz. This will refrain users from experiencing any sort of motion blur or jitter.

2) Field of View

It is the observable area that a person can see through its eyes or that of an optical device. A normal human vision has a 190-degree Horizontal and 120 Degree vertical. But that of most VR devices is 90 Degrees.

3) If we consider the mobile phones, they have huge limitations in terms of battery consumption and Display. This implies that the handset should have a high battery life to provide uninterrupted service to the user.

4) 5G as an enabler

4G internet speed is quite the norm for running VR based applications. However, with rising demand for high-end applications that are heavy to load, faster internet speeds are becoming a necessity. 5G speeds are a necessity for VR as improved versatile broadband is required to take VR encounters to a level that can provide reduced throughput requirements, buffering requirements, and lag for interactive content like tactile Internet and 6 DoF, extraordinary throughput, Multi-Gbps & low latency (about 1ms). There should be a negligible drop in quality from fluctuating bitrates, reliable service even in challenging regions and cell edge. With 5G spreading its roots in the future, it must support quick loading of heavy applications, provide a higher Bandwidth and offer low latency. This will also stringent the quality considerations of VR (Qualcomm, 2017).

5) For consistent utilization, and keeping in mind the end goal to exploit the greater part of the highlights of VR, a further developed system is expected to guarantee better quality and uninterrupted video content. There are a lot of regulatory barriers that further add to the burden of implementing VR based applications.

Any new innovation is inclined to a considerable measure of difficulties and the greatest of all is to incorporate the most recent technology to support it. Technological barriers have always been a major root-cause of failure for many organizations. Businesses have to be in sync with the latest developments in their areas of expertise so that they don't lose out to their competitors. Of course, developers and manufacturers are anxious to play a role in AR/VR expansion. Everyone

wants to get in the game early and optimize their market share. This competitive landscape creates problems. Lack of content eventually leads to the problem of distribution. Hardly any company wants to invest in VR apps to find that it only works on one of many possible devices. Many companies, and not just content creators, name their biggest obstacle to doing VR as having to choose which piece of hardware to distribute on. Different VR hardware and software are not compatible, and the content formats can't always be converted into others. This variety causes confusion among consumers. Without a proven leader in the industry, no one knows where the content will land. Consumers and developers are refraining to commit to a certain brand until they know it's a winner.

Legal issues

Copyright

The increase in AR/VR has not just gotten the consideration of buyers and those working in the business, yet additionally that of administrators and controllers. As an ever-increasing number of organizations create and misuse this innovation, they confront heaps of lawful issues, maybe most fundamentally in connection to the copyright challenges related to abuse of AR/VR innovation and substance. What makes VR convincing is its capacity to show innovative content and pictures in new ways, one of the potential reasons for the copyright issues. It is, in reality, a testing errand to keep the unapproved utilization of 3D content. Being aware of having consents to utilize copyright-secured content, it will be crucial to guarantee that any unique substance made for a specific application or gadget is appropriately ensured. One of the fundamental hazard territories is theft. This is as of now a major issue in the gaming and film enterprises so is probably going to be critical in VR as well. Today a great deal of theft in gaming is controlled with mechanical security measures (TPMs). These keep pilfered recreations from running on gaming reassures. This sort of innovation could be utilized as a part of AR/VR to help battle robbery issues by tying AR/VR substance to particular gadgets. There are, be that as it may, constraints on the utilization of TPMs. In reference to the impact of GDPR, facial images and real-time data capture should be compliant as per the new regulation.

Cost

Despite the fact that organizations have radically dropped costs on a few virtual reality headsets to advance deals, independent ventures and customers are careful about designating reserves for this sort of equipment, particularly since there's the additional cost of a powerful PC to appropriately run numerous head mounted presentations (HMD). In order to bring down the cost, headsets have to be lightweight, simple to-utilize, versatile and remain solitary HMDs that will give clients the flexibility of development without encumbrance.

Compatibility Issues

Along with the above-mentioned examples, security and regulatory hurdles faced by organizations is of utmost importance and they act as a restrainer towards the growth of VR. A few of such issues include-

1. Long battery life - As feature phones have only necessary applications, the phone has a long battery life and it also requires less bandwidth as compared to other smartphones.

2. Responsiveness of device - As feature phones have simpler hardware as compared to smartphones and do not process the huge amount of information as compared to smartphones the device is comparatively better in speed than any smartphone. Lesser the functions better the performance (Chirag Prajapati, 2018).

Potential Security Threats - Virtual reality (VR) is a standout amongst the most intriguing and engaging innovations developing today.

The enormous desires for the business haven't provoked much talk about VR's potential drawbacks. Like anything associated with the web, there are clear security dangers.

The theme has been raised in a couple of spaces, yet the extent of the risk truly relies upon selection and developing advancements. Here is a portion of the conceivable drawbacks to VR endpoints getting to be typical in the web of things (IoT) programming:

1. Privacy

Our information is never safe. Facebook as of now possesses Oculus, and the cover amongst VR and online networking will without a doubt develop. In any event, for the time being (we'll address future tech toward the end), if Facebook needs to assemble any of the information contained inside your Oculus gadget, it most likely as of now has it from your profile and movement on its site. Regardless of whether you're utilizing a VR headset in the protection of your

own home, whatever you're watching or doing can conceivably be recorded and sold. In any case, the same goes for our iPhones and workstations, so this will probably simply fortify existing conditions.

2. Monitoring

A VR item's seller, programmers could hypothetically penetrate your VR gadget and screen your action while you're sitting serenely on your sofa. They can accomplish more than pitch the data to an advertising organization or an item seller. Individuals could track your area, communicate with you, encourage or hack your system and take your credit data. Programmers could likewise alter your condition. The legislature could be another offender taking an interest in the demonstration of reconnaissance. Elements like the NSA and the FBI are always searching for another method for data gathering, and VR could without much of a stretch be one of their following stages.

3. BOTNET Attacks

Mirai, a standout amongst the most scandalous botnets on the planet, fundamentally close down the web a year ago. A huge number of endpoints were bargained, a considerable lot of which were webcams. A producer needed to review the greater part of its hackable gadgets. Numerous VR headsets have much more preparing power than a shrewd toaster or a keen ice chest, and they could give decimating levels of solicitations. DDoS assaults are a danger paying little respect to VR's effect, yet they remain yet another potential supporter.

4. Mind Hacking

Envision somebody hacking your framework and seeing your history and information as well as your cerebrum waves. Information can be gathered from huge amounts of various gadgets. Security has essentially been a myth since the beginning of the computerized time, and rumour has it the manmade brainpower programming Armageddon is drawing nearer. VR could be an innocuous release to the IoT, however, that doesn't mean you ought to be thoughtless with your safety efforts.

Cyber threats have now become an unwanted concern and there have to be some strict guidelines related to the protection of data by VR. Cyber-attacks on a VR user/ application implies stealing of personal data in user's devices. It may take the form of ransomware risks such as recording the behavior and interactions of the user. This can be used to threaten the user's thus demanding a ransom against the release of an individual personal information.

These cybercriminals can also gain the control of a device and display potentially harmful content. In the healthcare domain, a patient's health information is extremely sensitive and hacking may cause harm. In the e-commerce industry, essential credit card details can be misused by cyber criminals for personal gains (Aaron Walker, 2017).

Conclusion

With VR spreading its roots in different industries, the most prominent challenge it will face will aim at overcoming the technical barriers such as 3D Modelling which helps in creating an immersive environment enhancing the user experience. Mainstream adoption for VR will continue to remain a hurdle due to lack of government initiatives/ support and a weaker technological backbone. There can be a better user experience especially after the roll-out of 5G services in India that will further enhance the effectiveness of the application. The new General Data Protection Regulation (GDPR) controls have implications for any purchaser gadgets supplier, specialist co-ops, or different associations keeping and utilizing client information inside their tasks. With decreasing prices of VR gadgets coupled with the developing interest among mobile users, the availability of entry-level VR headsets in the market and a push from mobile device makers have become instrumental in boosting the VR market in India. With proper developments in these major areas of concern, businesses will begin to develop more and more content that supports VR.

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Cyber Crimes in ICT

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Abstract

With the tremendous growth in Information and Communication Technology, information is just a click away and communication is not a luxury anymore but a necessity for everyone. The world is connected round the clock, henceforth exposing whole new world for criminals who are just waiting to take advantage.

Cyber-crime business is growing with the evolution of technology as there is no entry barrier, software are open source and hiring a botnet, keystroke logger and hosting a website for phishing scam is just a few dollars even lower than the labour cost. Many of these crimes don't even require technical expertise. Cyber Criminals interact freely in web forums and deal in bitcoins.

Companies are taking preventive measure for the network and data security by following various standards and frameworks but a small gap can lead to huge leakage. Businesses are more vigilant than ever. This paper explores in detail the Cyber-crimes that may affect businesses, preventive measures, how their effects can be neutralized and the cyber laws which are in place to tackle them.

Keywords

Phreaks, semaphore, DECT, dial-through, wiretapping, vishing, cloning, cryptography, authentication, encryption, tumblers, GSM, 3gpp, PBX, IMSI, HLR, SIM, PIN, DOS, D-DOS, ransomware, spear phishing.

Introduction

Protection of Telecommunication industry is critical as various distributed systems and other industries rely on telecom sector for connectivity. Security attacks are not something new, rather are prevalent since long enough. Earlier enthusiasts were carrying out attacks on telecom companies to avail free calls, then criminals started to exploit system's vulnerabilities to evade wiretapping by police and then motive of fraud came when premium call rates were introduced. After liberalization of telecom sector, companies started attacking each other. Pattern is repeating now also but with much higher speed through the Internet.

In the days prior to postage stamps were invented, postage was paid by recipients. Unsolicited mails became a huge problem for Celebrities, so they were allowed to inspect the letter and reject if they don't want it. This regulation was not really effective as enthusiasts who study, experiment and explore telecommunication system, and are ready to exploit any possible vulnerability (Phreaks) started to send short small messages on the letterhead. Then early telegraphs which were based on semaphores were abused by people by tapping into it. Semaphores were basically relay stations which were situated in the line of sight passing some messages either through optical signals or through mechanical arm which was used to spell out the message. The modern telephone was no different to escape the phreaks.

Attacks on Billing

In early 1950's, the sound of coins dropping on the metal plate had to be listened by operators to tell that a user had paid, so some people acquired the trick of getting the right note to make free calls. Then in some place operators had to ask the caller his number, in which caller could give the number of someone else, who would be charged. These calls were placed mostly from callboxes so that the calling person could not be traced back. Therefore, callbox lines had a feature added to alert the operator. But in the U.K. implementation, there was a loophole: if a customer had called the operator from a callbox, he could depress the rest for a quarter-second or so, whereupon he'd be disconnected and reconnected, with no signal this time that the call was made from a callbox. He could then place a call to anywhere which is billed to any local number. This system worked upon the signals of entry of a coin, each of which consisted of the insertion of a resistance in the line which was followed by a brief open circuit. Then magic buttons were used for social engineering attacks which simulated this in the callbox, so that call could be made for free. Some countries started using chip cards instead of coins to cut costs and avoid vandalism. These chip cards were forged in myriads.

In 1970s, the problem of clipping your phone to a residential line came into picture, where homeowner was getting the bill of the facility used by someone else. But nowadays an authentication device is

mounted in the house and exchange to avoid this. Stealing dial tone from cordless phones was another type of this problem. New digital cordless phones uses DECT (Digital Enhanced Cordless Communication) standard for authentication mechanism. DECT is the de-facto standard for cordless telephony in Europe. Cryptographic algorithms and keys are used for authentication and privacy.

Vishing was another widespread trick where caller steals the sensitive information like passwords by acting as from reputable companies so that he could bill calls to you. Scamsters used all sorts of tricks to get people call them on premium rates for fake emergency messages about relatives, fake job ads and other gimmicks. To avoid these phone companies started advising people to not return calls to unfamiliar numbers or messages which are requesting a return call.

Insecure End Systems

The next major vulnerabilities after direct attack on the systems in premise of phone companies are insecure terminal equipments and feature interaction.

There have been a number of cases where people's answering machines were exploited by scamsters to trick them into dealing premium rate numbers. The problem arose from phone company switches which gave dial tone few seconds after the other party hangs up. So few blank seconds could be recorded on answering machine, followed by the tones of the number to which message is to be delivered, which could be used for calling premium rate numbers.

Private branch exchange systems (PBXes) fraud had become business in 1990s where company salesperson can call to a toll-free number and after entering his pin, he can connect. Low call rates of companies were exploited when these PINs were traded by fraudsters. This led to dial-through fraud. In some scenarios, where computers were attached to landline, customers were asked to download some program, which used to drop their line and connect them to some other call. And the duration of the call was up to the time when system is turned off.

Mobile Phone Cloning

The first generation mobile phones did not have any authentication in place and they used to send serial numbers directly on air through analog signals. These numbers were captured by crooks from the neighbourhood and services were bought and sold. Phone services were stolen and re-sold cheaply, often to immigrants or students who wanted to make calls to home.

Whenever secured data of a phone is copied into another phone, another phone could be used as an exact replica of the first phone. So the legitimate user is billed, whenever services are used by another phone because network provider could not differentiate between original and cloned phone. The cloner has a way to make his phone rings when the legitimate user dials so that he can even listen to his conversation. He has access to call, messages, and other services. One gets huge bill when his phone is called because the cloner can call from his phone and user could not find out. Be it GSM (Global System for Mobile communications) or CDMA (Code Division Multiple Access), phone cloning is a major risk.

Nowadays in modern cellular phones, authentication is done on both ends and mobile connects to base station whichever sends strongest signal and handing off process also takes place. So at some places attack is done by fake base stations where cell phone send their serial number to fake base station. Various mechanisms have been tried to reduce the number of frauds. Most operators have intrusion detection systems to track suspicious activities, such as a shoot in the volume of calls. A formerly classified military technology, RF fingerprinting is also being used by some of the operators. In this, differentiating signal characteristics are used to identify individual devices and linked them to their claimed serial numbers. Although this technique works and it nearly eliminates cloning fraud from analogue mobiles, it is not widespread used as it is expensive, due to the need of modifying the base stations. Various authentication mechanism like cryptographic authentication protocol was adopted to take care of other attacks.

Other Attacks

Whenever a machine or network resource is made unavailable to its intended users, it is called as Denial of Service (DOS). Services of a host connected to the internet are temporarily or indefinitely interrupted or suspended. Distributed Denial of Service (D-DOS) is a type of DOS attack where a single system is targeted by multiple compromised systems causing a Denial of Service attack. The incoming traffic that floods the victim originates from many different sources (may be hundreds or thousands or more). Stopping the attack simply by blocking a single IP address is not effectively possible due to number of distributed systems.

In ransomware, encryption or other techniques are

used to lock the date on victim's system, and ransom in form of payment is demanded to decrypt the data to return access of data to the victim. To spread the malware, malicious email attachments, infected software apps, infected external storage devices and compromised websites are used. Crypto Locker and wannacry are some examples of famous ransomware.
Various social engineering techniques like use of backdoors, zero-day or software exploits, and spear phishing are used to gain critical information. Spear phishing is a form of phishing in which specific organizations are targeted to gain access to confidential information by tactics like impersonation, enticement and access-control bypass techniques like email filters and antivirus. If a previously unknown security vulnerability is exploited on the day of its generally known, then it is called as zero-day. Whenever ways to bypass authentication process, created for troubleshooting and other purposes are exploited for gaining information, then it is called as backdoor attack.

Authentication Mechanism in GSM

The authentication protocol for authentication works as whenever cell phone is powered on, SIM (Subscriber Identity Module) requests PIN and on correct entering the PIN, it sends IMSI (International Mobile Subscriber Identity) to the nearest base station, which is then sent to HLR (Home Location Register). HLR generates 5 triplets which consists of RAND (random challenge), SRES (Signed response), and Kc (ciphering key). Relationship where RAND, encrypted in SIM's authentication key Ki gives output as response concated with ciphering key Kc is:
{RAND}Ki = (SRES | Kc)

Standard way for encryption is one-way function known as Comp128 or A3/A8 which is a hash function with 40 rounds.

It looks like a complex hash function that it seems to be impossible to find the output of hash function, but once its design is leaked, a vulnerability was found where 2 bytes were fixed for any SIM card while other 2 bytes were changing based on the challenge function. So the effect was that authentication key could be extracted in several hours using a software available on the internet for the SIM that uses Comp128.

The triplets were sent to SIM from base station which computes response based on RAND and sends response to base station which validates the response and communication between mobile and base station starts.

Triplets can be replayed, so your SIM get five triplets and keep on reusing them to allow you to call as much as you want. Roaming network does not need to refer back to your home network for authorization and even if they do, your visited network might not send bill for a week or more. So it prevents your home network from shutting down your services. This is the reason why operators ask for credit card details before giving international roaming on prepaid services.

Encryption in GSM

GSM systems were supposed to give confidentiality by encrypting the traffic once authentication and registration is done for the user. The speech is digitized, compressed and sampled. Each sampled packed is encrypted by xor-ing it with a pseudorandom sequence. This A5 algorithm was originally a secret and once it was leaked, many vulnerabilities were found. In the arrangement 3 linear feedback shift registers were used and their outputs were combined using xor to form output.

The obvious attacks were to guess 2 short registers and then working out the third one. It was slightly complex as 41 bits were to be guessed and the generator loses state also.

The reverse engineering systems has shown that keying of A5 was weakened deliberately. As in actual implementations, the ten least significant key bits were set to zero. In many countries, they have further weakened version of A5 known as A5/2.

3gpp Security

In the Third generation of mobile phones or Universal Mobile Telecommunication System (UMTS), the security is much the same but upgraded by removing the vulnerabilities of GSM. The crypto algorithm Comp128 and A5 are replaced by a cipher block known as Kasumi where all keys are 128 bits.

In the 3gpp authentication protocol, RAND challenge is sent from the home location register called as home environment (HE) and UMTS SIM (USIM) enciphers it with the authentication key K to generate response (RES), with a confidentiality key (CK), an integrity key (IK) and an anonymity key (AK).
{RAND}k = (RES | CK | IK | AK)

In the 3gpp, confidentiality would be a higher quality implementation as eavesdropping on the air link would be prevented and the possible attacks on the backbone network by bogus base stations would be excluded.

Conclusion

For decades people are trying to exploit the system, and recently the service providers have been vigorously returning the compliment. Earlier, it was easy to evade charges as system was not really protected. Out-of-band signalling was adopted to prevent this but due to increasing complexities, new vulnerabilities have been opened and it proved to be inadequate. Vulnerabilities range from insecure end systems and social engineering attacks on users to unpredictable failures. Security is never full proof and once the vulnerabilities are open, they are attacked. As in cryptography, both Comp128 and A5 were broken once they were made public. Security resides in the choice of key rather than the mechanism. The mechanism will leak sooner or later. The compromise in these algorithms only helped large country intelligence agencies as they had access to the call traffic. The advancement from GSM to 3gpp did not stop the criminals but rather their modus operandi changed with the cost falling on credit card companies or identity theft by phishing and nothing has changed for dial-through fraud.

Overall, the environmental changes have led to security issues in Telecom. Changes such as liberalization, which brought many service providers in the market and premium rate numbers led to the sudden involvement of real money wherein earlier companies sold service with a negligible margin. Previously the only benefit that could be made was called but now real money could be made by exploiting the vulnerabilities. Fairly serious effort to secure GSM also got nullified by growing complexities. The next-generation mobile service, 3gpp, seems to be capable of doing slightly better in terms of security; but we have to wait and see how long it can prevent scamsters from taking advantages of loopholes.

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DIGITAL TWIN

Samiksha Manwani, Riya Jain

Abstract

Digital twin refers to the virtual representation of the product in which the virtual model is connected to the physical object through a cloud-based system. The physical object contains smart components equipped with sensors to detect anomalies, early warnings of glitches and predictions. It monitors real-time status, working condition or position to plan our equipment service, equipment operations and improve operational efficiency by applying advanced analytics, machine learning and AI to gain unique insights. Digital twins depend on IoT technologies as they help companies make a better decision by leveraging specific data about physical assets.

From home machine producers to health care and from modern industrial organizations to electronic gadget organizations, the Digital Twin fits in almost every business to control and monitor the operations with the most advanced capabilities. This paper focuses on the future of digital twin in the critical processes of companies investing in IoT-based operational sensing and cognitive-based situational awareness combined with various technologies. This is also an attempt to explain how Digital twin drives the business impact of IoT in monitoring and controlling assets and processes.

Keywords

Architecture, Digital Twins, Virtual Connection, Business Value, Applications, IoT

Introduction

Digital Twin will enable the organization to have a dynamic digital representation right from the design phase to the deployment phase of their product. Digital twin helps businesses to better analyze and predict the problems in advance, develop new opportunities and plan better products for the future at lower costs by using simulations. This is done by its capability of generating data in real time. All these will have a greater impact on delivering a better customer experience in business as well. Digital Twins are predominantly used in the Industrial Internet of Things, engineering, and manufacturing business space as it incorporates Big Data, Artificial Intelligence (AI), Machine Learning (ML) and the Internet of Things are key in Industry 4.0. Digital Twin is cost-effective and accessible to the business world only because of the Internet of Things.

Literature Review

The first definition of the DT was forged by the NASA as "an integrated multi-physics, multi-scale, probabilistic simulation of a vehicle or system that uses the best available physical models, sensor updates, fleet history, etc., to mirror the life of its flying twin. It is ultra-realistic and may consider one or more important and interdependent vehicle systems". As it is evident, the main scope of the original definition of the DT was to mirror the life of air vehicles with a series of integrated sub-models that reflected different aspects and vehicle systems, by considering stochasticity, historical data and sensor data, including in this way interactions of the vehicle with the real world. Only in subsequent research works, published in the same year, other aspects emerged such as the life-cycle view, the check on mission requirements and the use of the DT for prognostics and diagnostics activities, which then remained as core characteristics of the concept in future works. In 2015 with the work by Rios and colleagues, the definition of DT comprised a generic "Product", opening the way to the use of such a concept in other fields rather than only air vehicles, even though their work was still inserted in research about aircraft structures. Alongside the research in the aerospace field, in 2013 the first works reporting research on DT in manufacturing sector appeared. In particular, it was considered to be the virtual counterpart of production resources and not only of the product.

Research on the DT in manufacturing is an evolution of the already ongoing research stream about Virtual Factories (VF). These are defined as the digitalization of the plant integrated with the real-system coming in help to the production during all the lifecycle of each asset. Works on the VF underlined the importance assumed by a proper semantic metadata model to support the necessary information structuring. The semantic Virtual Factory Data Model (VFDM) has been developed, which establishes a coherent and extensible standard for the common representation of the factory entities, such as buildings, processes, products, and

resources, giving in this way a holistic view of the production environment. The DT goes beyond the VF to include a real-time synchronization with the physical system so that the user or the autonomous system can take the right decision about the actual and the future production, based on a wide range of available information. Also, the DT must, therefore, be supported by a proper data model structuring information about the system operations, its history, its behavior and its current state. (Negri, E)

step, the disparate array of data sources from the Data Collection stage is merged into a single coherent model and exported into the Element Graph. Multiple data sources are merged and transformed into a graph by using a visual programming language and this forms a digital pipeline. In addition to collecting, modelling and organizing data we need to establish confidence in the graph model, which signifies Data integrity. The data needs to be checked before it can be trusted for use in analytics which requires identifying what data is

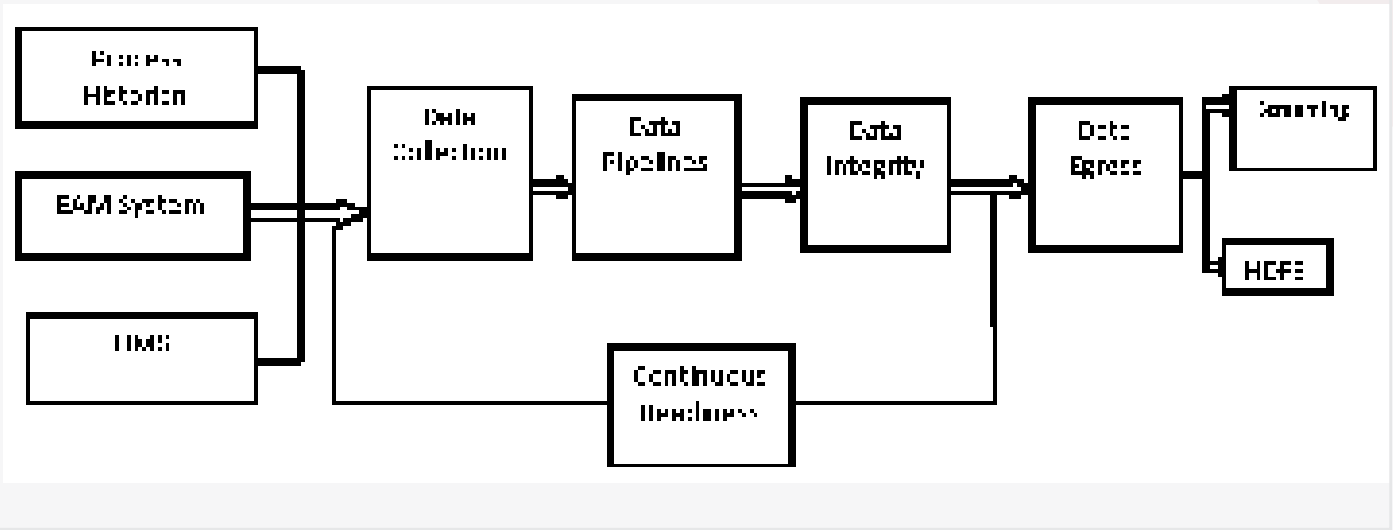

Fig 1. Architecture of Digital Twin

The Architecture required to maintain Digital Twins

This architecture provides the steps to identify the potential errors and reducing them in the process to keep the data always ready for any digital application and avoiding the bias of hand picking the right sensors for an application. The Industrial Digital Transformation begins with building Operational Digital Twins.

Digital twins comprises of two types of data: model data and time series data. To construct the digital representation of real-world things and the relationships between those things Model data is used. Time series data represent observations of the state of some physical thing at a given time. These two data types can be built into the DT by aggregating data from systems that already contain the data - your existing IT and OT investments. Once these independent data stores are aggregated and linked together, these data sets can be used to perform high-value analytics. The next step is the creation of the Digital Twin for the data collected, using the Element Graph Studio. In this

missing, corrupt or suspicious. Establishing trust in the Digital Twin requires both Data Model Assurance which is accomplished by comparing Digital Twin Templates to the physical devices themselves and analyzing the time series data to detect all the issues. The final stage after collecting, organizing into a digital twin and analyzing the accuracy of the data, is making use of the digital twin you've built to unlock a whole range of analytics value which comes under Data Egress. (McCormick, S)

Virtual Connection

Digital Twin technology is the link between the physical world and digital world. It gathers data from sensors that track the working of a physical object and then employs algorithms that provide a deeper understanding and awareness about the future, based on the dynamic model respond technique. Sensors here alert the users if the machine is about to crash or if it fails, which saves a lot of cost and time particularly when using big machines. The machine learning process here doesn't require any knowledge

Fig 2. Virtual Conversion in Digital Twin

of machines operation. It just requires a learning phase to anticipate the system performance. Digital twin is an effective software model that generates digital information for digital products. A Digital Twin combines the physical asset with the essentials such as cloud, IoT, and other technologies. These allow the data to be collected, analyzed, and monitored from a real integrated system. The virtual aspect provides the benefits of playing with as many variables and limitations to understand its usage in the real world. Digital Twins essentially differ from virtual models in terms of it being more interactive. In addition, they can couple a physical and a virtual object together to be able to create new revenue streams and can transform the operations dynamically. If Artificial Intelligence (AI) is added, it becomes capable to transform the entire operations and testing set-up where we could simulate environments in entirety with AI redefining some of those components and can save cost as well. (Sharma, G)

IoT

The concept of a digital version of every physical thing has gained momentum with growing deployment of the Internet of Things. The real-time data that is collected, analyzed, and combined with other types of data (context, behavior, variables to name a few), which is then presented for consumption can be generated with IoT. To build a virtual counterpart capable of being molded, tested and compared against real-time and historical data, multiple streams of data from a physical object that can be used is generated with the help of IoT and AI.

For example, take an IoT temperature sensor in a building. The temperature sensor has data readings, the type of data that it is recording and its location. AI system understands the general concepts of physics and how temperature is influenced by heating or cooling, such as environmental factors, heat system controls and so on. A knowledge graph is formed in the system to understand the multiple factors that impact the temperature within its operating environment. This allows for the self-diagnosis of problems within the system while enabling it to learn and understand this relationship over time.

The virtual testing platform and knowledge graph for IoT demonstrate the value of Digital Twin. The virtual testing platform can simulate these large-scale environments and networks while providing a way to perform controlled user-acceptance tests. To understand management operations, to learn system behaviors, and to self-diagnose problems with the system, the knowledge graph is the scalable solution for IoT, and all this while making human-machine interaction more natural and intuitive. (Padua, V)

Business Value

1. Validate Your Model with Real-World Data

Digital Twin will help to understand the operational environment for record retention serialization so as to improve performance and to reduce operations and process variability.

2. Track Operations for Decision Support and to Alert Users about Anomalies

To better manage recalls and warranty claims and meet mandated tracking requirements, a digital record of serialized parts and raw materials can be created.

3. Predict How Assets Will Change Over Time

Digital twin can detect and control quality trend defects and quality escapes sooner and is able to determine when the quality issue started warranty cost and services so as to proactively and more accurately determine warranty and claims issues to reduce overall warranty cost and improve customer experiences Operations cost. Using the Digital Twin can improve operational procedures and it can even be embedded in the control system loop for contingency plans.

4. Get Design Feedback

Digital Twins in manufacturing will help to improve product design and engineering change execution, to detect potential quality issues earlier on or even improve the quality of the product being manufactured through the delivery of new insights.

5. Discover New Revenue Streams

New revenue streams can be created from the data itself. It is possible to develop a Digital Twin of almost any product because of various cost models for sensors, communication, analytics, and simulation. The Digital Twin can be considered as a comprehensive tool, because of its ability to help out countless verticals in an organization. Identify products in the field that are ready for an upgrade and to improve efficiency and cost of service product. Better recognize long-lead-time components and impact to supply chain Revenue growth opportunities.

6. Maintenance

A digital twin is capable of analyzing performance data collected over time and under different conditions. For example, the required maintenance in a car engine such as component that is about to burn out can be visualized with the digital twin.

7. Customer experience

Customers play a key role in influencing the strategies and decisions in any business. The ultimate aim of any organization is enhancing your customer's experience and in turn to gain and retain a large customer base, a digital twin can help boost the services directly offered to customers. For example, a digital twin could be used as a visual twin of the customer to check the final look. (Wasserman, S)

Applications

1. Automobile - Creates the digital replica of a connected vehicle

Digital Twin is the best technology for building the digital replica of a connected vehicle. It helps to analyze the overall performance of the vehicle and the connected features as well.

Example

• Hero Moto Corp was the first automobile company in India that started a project on Digital Twin in 2016 to make the changes and improvements digitally before spending money on physical facilities.

• NASA uses the digital twin technology to build the next generation space crafts which are completely impossible to track in the physical world i.e. in real time.

2. Healthcare

Delivers high-quality services to patients

The quality of health services delivered to patients can be improved using digital twins. A hospital system can be virtualized using the digital twin in order to test the impact of potential changes in system performance and to create a safe environment.

Example

• Recently, Dassault introduced "The Living Heart" which is a heart of digital twin created over a period of 2 years.

• Surgeons at bioengineering institute have built a digital lung that operates like a blood and flesh one with 300 million alveoli.

3. Retail- Offers best consumer experience

Customer experience plays an important role in any retail business. A digital twin enhances the customer services by designing modelling fashions and virtual twins for them. In addition, it also offers better security implementation, energy management, and in-store planning in an optimized way.

Example

• Grundfos uses digital twin to serve their customers effectively through enhanced performance and product quality, optimized maintenance, improved

development, productivity, and reduced overall risks and costs.

4. Smart Cities- Improves the economic development of a city

A digital twin can be used to optimize urban sustainability by capturing the spatial and temporal implications. The city planners can achieve the desired results in the future with the help of the data gathered by the digital twin.

Example

• 3DEXPERIENCity i.e. 'Virtual Singapore' is a project that is in progress now and is anticipated to be done by 2018. As Singapore's population is growing at a rapid pace, this will help improve the status of its living environment.

5. Industrial Firms- Monitors and manages the industrial systems digitally

A digital twin can gather the operational data as well as environmental data such as configuration, location, financial models and more that helps in anticipating the future anomalies and operations by virtually tracking and managing the industrial systems.

Example

• GE's (General Electric) digital wind farm concept is the best example that shows how digital twins will enhance industrial performance. Digital wind farm helps to develop the structure of wind turbines before manufacturing. (Joshi, N)

Future

Global digital twin market is projected to grow at a CAGR of over 37% during 2017-2022. Industry 4.0 facilitated manufacturing momentum followed by increasing penetration of SMACT (Social, Mobile, Analytics, Cloud and Internet of Things) technologies are a few of the factors driving the global Digital Twin market.

With the increasing adoption of IoT, growing digitalization in the marketplace from records to blueprints to assets, hundreds of millions of things will be represented by digital twins. They will be used for planning and repairing equipment services, predict equipment failure or increase operational efficiency, planning manufacturing processes for operating factories. They will perform enhanced product development by replacing the combination of skilled human resources and traditional monitoring devices. (TechSci Research)

Conclusion

The digital twin will drive an incentive for organizations, make new income streams, and enable them to answer key inquiries. A digital twin has numerous applications over the life cycle of an item and may answer inquiries progressively that couldn't be replied previously, giving sorts of significant worth considered about incomprehensible only a couple of years prior. The digital twin will act as a proxy to the digital world by accumulating data over time about the structure of the system, its operation, and the environment in which it operates. The data develop intelligence using analytics, physics, and machine learning. Digital twin of a specific system will provide early warnings and predictions and also the information about past and present performance and operations.

The major challenge is the convergence of existing data into an accessible template which incorporates IoT data, both 3D and 2D designs, process and quality control to provide a full life view of a product. Due to the variability, uncertainty, and fuzziness of physical space, building models in virtual space to mirror entities with high fidelity is a fundamental issue. In addition, when inconsistencies between models and entities appear, how to identify and utilize them wisely is also difficult. Also, security is another focus that ensures the normal operation of physical and virtual spaces against the malicious. (Ujhazy, H)

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Electric Vehicles: Predictive Analysis on Adherence Level of E-Cars by Study of Socio Economic Aspect

Aniket Porje, Pooja Karale

Abstract

This paper provides insights on consumer behavior and helps understand the various socio economic factors that will play an important role in the acceptance of electric vehicle (EV) in India. Different country's EV trend, EV in Indian market, government support for EV, challenges, benefits of increasing usage of EV are the focal points in this research. The growing threat of global warming, extreme dependency on fossil fuels, and ever-increasing fuel prices are some of the reasons which have played an important role in the the acceleration of the development of EV. Transport sector is a major contributor in the overall greenhouse gas emission. Transport sector is estimated to increase emissions by 84% in 2030. Basic objective of study is to understand if Indian consumer is ready to adapt EV and what will be the factor that will act as opportunities and challenges. Also, to compare and analyze the market development, government support and willingness of customers towards adapting the EV and test the hypothesis whether India will adapt the EV by 2030 or not by primary research.

Introduction

The forecast for automotive industry of India by 2026 is that it will be the third largest market by volume in the world. Electric cars are likely to be a sizeable market segment in the coming decade. E-cars is the next trend of the era but the main challenge is to implement it across the nation. We traditionally believe in measuring the success of any innovation or technology which is experimented or implemented in another part of the world. But, we have our goal very clear Electric revolution – Green cars. Let's understand some future project aspects in this revolution: The Department of Heavy Industry (DHI) is launching pilot projects on electric vehicles in various metros and cities all across the country under the NEMMP 2020 with a dual purpose - demonstrating and disseminating the benefits of adapting cleaner, greener modes of transportation as also to explore the viable operational modalities. The uptake of electric vehicles will depend in large part on the adequate deployment of Electric Vehicle Supply Equipment (EVSE) needed to recharge electric vehicles.

Automobile sector in India

Automotive industry in India is one of the fundamental mainstays of the economy. With solid in reverse and forward linkages, it is a key driver of development. Progression and cognizant strategy mediations in the course of recent years made an energetic, aggressive market, and brought a few new players, bringing about limit development in vehicle industry and age of enormous business (The Ministry of Heavy Industries, India). Indian car part is in accordance with its worldwide associates, the car business in India is set to witness significant interruptions by the turn of the decade, as electric vehicles (EVs), shared versatility, stricter emanation, and wellbeing principles (Pawan Goenka, MD, M&M, 2017). Our vision is that throughout the following decade, the Indian vehicle part should contribute more than 12 for every penny of the nation's GDP. We (car industry) need to make about 65 million extra occupations by 2026 (Kenichi Ayukawa, MD, Maruti Suzuki, 2016). The Government's Automotive Mission Plan (AMP) 2016– 26 imagines the business to develop around four times by FY26 with roughly 10% CAGR for vehicle deals volumes. The Government's push to assembling through the "Make in India" activity has accumulated extensive consideration from the business and brought the spotlight back on the assembling segment (EY, 2016).

Electric cars in Automobile

There are elevated standards for electric vehicle to change wellbeing into a practical and safety measure based framework. The acquaintance of elective vehicle advancements with reacting to the transportation division weight in regards to petroleum product reliance offers conversation starters in regards to their effects on movement and driving conduct yet additionally on the earth (Catarina C.Rolima, Gonçalo N.Gonçalvesa, Tiago L.Fariasb, Óscar Rodriguesb, 2012). The coordination of electric vehicles (EVs) will influence both power and transport frameworks and research is required on discovering conceivable approaches to influence a smooth change to the charge of the street to transport. To completely comprehend the EV joining outcomes, the conduct of the EV drivers and its effect on these two frameworks ought to be considered (Charalampos

Marmaras, Erotokritos Xydas, Liana Cipcigan, 2017). Environmental and vitality security reasons are setting Electric Vehicles (EVs) as a noteworthy part later on street transport systems (Element Energy, 2013). Road EVs incorporate a vast scope of vehicles from electric bikes, three-wheelers (rickshaws), autos and electric transports. Moreover, module electric vehicles can be characterized into two sorts: battery electric vehicles (BEVs), and module cross breed electric vehicles (PHEVs) (Ordered by - NSGM-PMU).

Social Conditions

The accomplishment of electric portability items relies upon the satisfaction of clients' desires (Pierre M, Jemelin C, Louvet N, 2011, Sammer G, Meth D, Gruber CJ 2008). In the past electric vehicles were not able to address requirement and issues of clients. Subsequently, in Germany, the number of inhabitants in electrically controlled vehicles represents less than 1 % of all autos (Sammer et al. 2008). Not only the Germany social movement regarding increasing social awareness for growing environmental concern by educating the consumer and along these lines affecting advancement procedures of organizations which give green innovations (Ustaog˘lu and Yıldız 2012). Vehicle class is an important aspect for the likelihood of buying an electric car, between 12 to 25 %. Particularly for smaller car segment, the acceptance is much high in 2020. Also, the larger vehicle segment also overseen for growth in 2030, the reason for this growth is technological advancement lead to decrease prices. Other than the price, an environmental concern also plays an escalating factor to purchase choices. It is additionally analyzed that the acknowledgment of electric vehicles is impacted by various individual factors, such as educational degree, annual income, and number of past vehicles or government policies. Price which is most sensitive factor of electric car acceptance depends on number of family members, cost of maintenance and degree of safety (Zhang H, Shi Y, 2011). Besides the value, purchasers additionally consider subjective angles like status or style (Sammer G, Stark J, Link C, 2011) and it is likewise imperative how individuals get information on electric vehicles, e.g. by relational correspondences or by the media, and how inclinations, e.g. on ecological issues, change after some time (Gould and Golob 1998). Electric vehicles have met the basic necessities as far as normal range and flexibility, particularly if the electric vehicles can be charged at home (Arnold H, Schäfer PK, Höhne K, Bier M, 2012, Pehnt M, Höpfner U, Merten F, 2011). The major obstacle for commercialization of e-cars is its limited range of 150– 300 km (Hawkins T, Gausen O, Strømman A, 2012). Clients have turned out to be acquainted with the way that regular vehicles have a scope of up to 1,000 km (Chlond B, Kagerbauer M, Vortisch P, 2012). Overall there are many opportunities for this segment but these are dependent on technological advancement in terms of information transfer, battery and security. For the future it is still to be examined how the client will acknowledge the new versatility ideas, which consolidate electric vehicles with different administrations to repay the shortcomings of electric portability. Moreover, it appears to be important to explore how the past portability propensities which prompt physiological obstructions could separate with the goal that the general population reconsider their versatility choices. In Indian scenario price will play an important role as Indian customers are more price sensitive. But if there is a push from the government and support by manufacturer, the cost can be reduced by mass production and government policies.

Ecological Conditions

The entire electric energy based car is an innovative business plan, which includes the use of renewable energies (Barkenbus 2009, Brady and O'Mahony 2011, Pehnt et al. 2007, 2011, Schill 2010a). Electric vehicles have a high proficiency and by charging renewable power they nearly make no emissions. This obviously expects that the required feasible electric energy can be given in the appropriate sum at the correct time. Nevertheless, it is very difficult to predict ecological potential for electric vehicle. Indeed, there is just a couple of information on ecological impacts in light of observational cases and tests, e.g. the CO2 outflows of electric cars (Kudoh Y, Ishitani H, Matsuhashi R, 2001). It is likewise minimal thought about the effects of electric vehicles and their segments over their life cycles (Held and Baumann 2011). Besides, the question emerges, what is the market requirement of electric energy after studying potential of electrical mobility (Lieven T, Mühlmeier S, Henkel S, and Waller JF 2011). In spite of the fact that the genuine utilization of electric vehicles practically speaking is higher than as indicated by manufacturer's guidelines, the potential for decreasing emission is high. In the meantime, it is called attention to that the expanding utilization of electric cars would not drastically build electricity request (Nischler G, Gutschi C, Beermann M, Stigler H, 2011). More focal queries on identify with the geographic position of charging stations and in addition to the effect of charging techniques on the usage (Hartmann and Özdemir 2011). Another issue is the examination of the proficiency of the drive prepare, with utilization of lower energy consumption under different environmental condition (Estima and Marques Cardoso 2012, Hwang and Chang 2012). Notwithstanding the

vehicle, the whole framework for filling and upkeep of vehicles could likewise be dissected regarding asset utilizations. It can be demonstrated that the framework for electric vehicles is more carbon and vitality concentrated than for diesel and petroleum vehicles (Lucas A, Silva CA, Costa Neto R, 2012). Some open issues are the examination of portability examples and atmosphere impacts as far as utilizing electric vehicles. That implies how and to which degree the utilization of electric cars truly substitutes other mechanized individual adaptability or whether it rather prompts extra movement. In India, there are bigger challenges as the entire country is still not electrified. Increase use of electric car will lead to high demand of electricity requirement. If the government plans to save on gasoline it should invest to produce more electricity from natural resources.

Hypothesis Formulation

In the hypothesis formulation, a combination of four factors has been considered. Cost as a factor: (Customer is more dependable on the cost as high cost led to more expectation of utilization. Indian customers are cost sensitive; they first check cost and then the features.) Social as a factor: (Customers take decisions about their comfort as per status which is a combination of gender; previously owned a car and its daily usage. In India social status is decided on the basis of how the particular has conducted.) Ecological as a factor: (How much energy is available to use and what does it impact on the environment. Traditional diesel and petroleum-based vehicle how badly impacting on our future.) Regularity as a factor: (Customers are influenced by the government policies. If the government is ready to provide infrastructure and support for developing it, many business models come to contribute and demand is generated.)

H1: Cost Parameter has significant relation with the adherence of electric vehicle.
H2: Social Parameter has a significant relation with the adherence of electric vehicle.
H3: Regularity Parameter has significant relation with the adherence of electric vehicle.
H4: Ecological Parameter has a significant relation with the adherence of electric vehicle.

Primary Research

Primary research was conducted to a sample size of 117 potential customers for electric cars from city of Pune, Maharashtra. This was done by structured questionnaires. Additional information was also collected by different sources.

Analysis

Factor analysis was used to group the eleven attributes of enhancement factors that affect the adherence level of electric cars. The response is collected on eleven attributes which are then converted on the factor. The factors extracted by Factor Analysis which lead to group ten attributes from the questionnaire into four factors.
Regression analysis was further carried out to confirm the relationship of the customer's interest level of adherence to e-Car with the four factors cost, social ecological and regularity also with the utility of vehicle in the context of comfort and attractiveness. Regression analysis was done to confirm that a linear relationship exists between the above factors. The results of Factor analysis and Regression analysis was used to validate the above stated Hypotheses which helped in arriving at appropriate conclusions.

Outcome of Factor Analysis

Based on factor analysis with principal component method outcome, Factor 1 (Cost factor) comes out as the most critical factor that explains 20.89. % of the total variation (Table 1). This is followed by Factor 2 (Social factor) that describes 15.84% of the total variation (Table 1). This is followed by Factor 3(Regularity factor) which explains 12.34% of the total variation (Table 1). Factor 4 (Ecological factor) which describes 10.57% of the total variation (Table 1).

Secondly, all the four statistically significant factors explain 60.05% of the variation. This indicates that 60.05% of the influence of impediment factors (four factors) on patient's level of adherence to medication towards addressing the impedance with the help of technology enabled care providers. Factor scores of most Attributes are more than 0.7 which indicates that they are highly significant (Table 1).

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.299	20.899	20.899	2.299	20.899	20.899
2	1.743	15.847	36.745	1.743	15.847	36.745
3	1.358	12.349	49.094	1.358	12.349	49.094
4	1.163	10.577	59.672	1.163	10.577	59.672

[redacted]

Table 1. Statistical outcome of Regression Analysis

The model summary shows that R value in this study is 0.810 (Table 3) which signifies that 82% of the variation was explained by the impediment factors. As this is between 0 and 1, R square value is significant. The table coefficients provide information on the confidence with which we can support the estimate of p value of the model, 0.000 (Table 4) which is less than 0.01 signifying 99% confidence in the value of the estimated coefficient. These suggest that linear relation exist between cost, social, ecological and regulatory factor to affect decision of Purchase of E-car.

Hypotheses testing

H1: Cost Parameter has significant relation with the adherence of electric vehicle.
H2: Social Parameter has a significant relation with the adherence of electric vehicle.
H3: Regularity Parameter has significant relation with the adherence of electric vehicle.
H4: Ecological Parameter has a significant relation with the adherence of electric vehicle.

The output of the factor analysis with respect to four underlying factors as Cost sensitive factors, Social related factors, Regularity related factors and Ecological related factors. This determines that there are four basic factors which customer evaluate while considering for E car as an investment. Also, the utility of e-car like battery backup, high speed, attractiveness has a direct relationship with the four above mentioned factors. Moreover, the output of regression analysis shows that R square of the attributes of 4 factors in this study is 0.810 (Table 3) which signifies that 81% of the variation was explained by the 4 factors. This signifies the acceptance of the first four Hypotheses.

Table 2. Model Summary

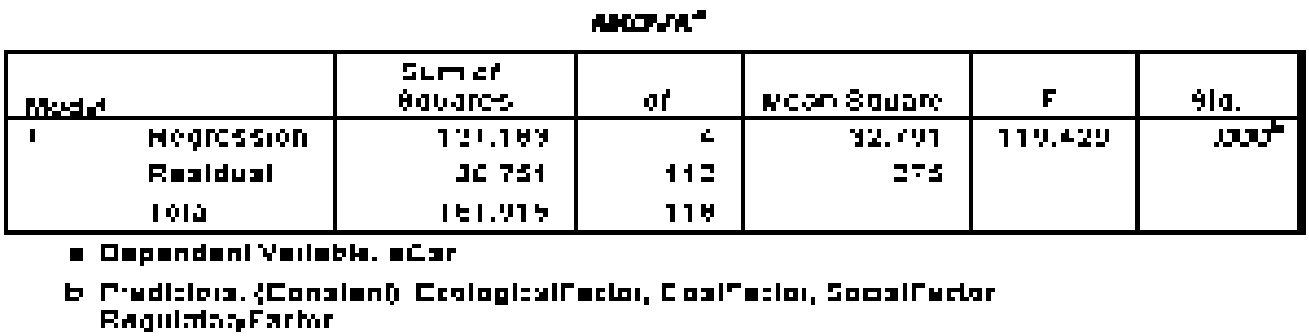

Table 3. ANOVA analysis test output

Conclusion

The study aimed at exploring the factors affecting the customer's decision-making level of purchasing e-Car. The study found out that the customer's level of adherence to e-Car will increase if the most critical factors like cost, social, regularity , and ecological awareness are managed on a proper level. Customers are interested in adapting the pollutant-free technology as it saves energy and environment.

There are several barriers in adapting electric based solutions which could be grouped as lack of advancement in technology, affordability and utility issues. Study proposes, if government plans and provides support to the whole ecosystem of its new initiative of electric vehicle, Indian customer are ready to adhere.

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Feasibility and success rate of chatbots on Websites with reference to their customer association

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Abstract

The ripening of AI and it abounds applications have unlocked gates to the phenomenon of inanimate objects being bestowed with the gift of speech, something extremely stirring about creating a non-living entity and then having a conversation with it. Chatbots as systems are set up to mimic the human conversations, providing the amusement value to the user interface platforms. Major brands deploy goal-based conversational agents on websites to assist consumers, answer questions and solve problems using machine learning analysis and artificial intelligence. This paper makes an effort to explore predominant drivers of its surge, establishing a paragon with the business rationale of the chatbots and the results that they are able to bring down with the connection established with the consumers. The principal requisite is, therefore, to examine whether privacy and hacking are a concern to this application of AI that would be scrutinized in the paper. Furthermore, the major architectures of chatbots are comprehended alongside their alignment with the psychology of human grades and increasing stride of digitization impact on them.

Keywords

AI, ELIZA

Introduction

Chatbots at the basic level can be described as a piece of software that is a conversational interface which was designed to manifest the efficiency of customer care services. According to the predictions of the world economic forums, chatbots would be an inexorable part of the next industrial revolution. Some major attributes that chatbots are accounted for are their superior learning capability, faster responsiveness, simpler to build, which is the crest is aimed towards providing solutions to consumers. There are various factors yet to be discovered in the Chatbot territory which unifies to build an automated customer service. Technology is in a phase of the continuous switch, few fades away with the advent of time, and the others stand ground and remain the dominant force in the market. Messaging is one such vogue that is now inclining towards chatbots as well. Timely and differentiable customer service is the need of the hour and demanded by consumers. These personal assistants generate human-like connections with the consumers with some examples being Microsoft's Xiaoice, Amazon's Alexa, and Apple's Siri etc. Modern consumers gaze for reliability, to gain confidence from these set of consumers is a prime task for the chatbots.

Rise of Chatbots

The digitalization of the all the industries has scattered its sweep establishing a rostrum where innovation has become the essence of development. Analogous to that is the rise of chatbots, which is becoming a vibrant option to deal with customer service and is in process of elaborating its functions to increase the efficiency. It is profoundly definite from the recent study done by Gartner that chatbots would be in charge of managing 85% of all the customer interactions by 2020. This evolution has happened about in various stages. The hatch of this technology initiated as early as 1950 with Alan Turing's intelligent machine which was then succeeded by another intelligent machine that could establish a quality interface between a machine and a human, making it more tangible- ELIZA. The graph did not show a steep until now, attributing its presence to the increasing demand for customer-oriented processes and competition. The major drivers for the chatbots rise are:

1. The upswing in use of messaging applications by every generation

The preferred channel of communication is what the messaging applications have transformed into. The number of people getting connected through these platforms is amplifying rapidly. Chatbots operate on an identical methodology which contains enormous prospective for market penetration.

2. The augmenting prominence of conversational interfaces

Facebook's annual developer conference (F8) has bolstered the need for technologies that whirl to establish more human-like dialogues and discourse. The superior level of chatbots that is illustrated by 'Siri' and 'Cortana' are the versions that demonstrate the dialogue discourse in the voice form. These applications

are predicted to shelter the increasingly connected world.

3. Propelling growth of Artificial Intelligence

The statistics of AI market that blankets all the major technologies such as Machine learning, Image recognition, and speech processing are predicted to hit a mark of $5.05 billion by 2020 as per the studies released by Statista.

4. Customer oriented progression

The call center approach of staying bounded with the consumers has been arched whilst few years. The emphasis on customer experiences and rendering towards a differential hem when in strife to excel amongst the intense competition has led to the rise of chatbots. Cost-effective, and user-friendly as prime characteristics chatbots serve the end user as the first point of contact with the reduced hassle and a much-simplified process.

5.Automation on the spree

The systems and their according practices are being developed to curtail the human intervention and create an automated chain to increase efficiency and making certain of a seamless assistance from the service providers end.

6. Highly- remunerative and cost-effective

The costs that are incurred while building a chatbot have come down significantly enabling enterprises and organizations at all levels to implement the AI based customer support for enhanced customer experiences. The conversational tools building architecture is simpler when compared to the apps, making them easier to deploy.

Chatbots in Marketing

Chatbots as tools are employed to respond to the basic queries of the consumers encompass fundamental product information, enterprise information, services the organization offers etc. But these dialogues and discoursed are advancing towards answering more complex queries that intend to give a humanized touch to the conversation. Chatbots get smarter with every articulation; they learn from the previous interactions and become more and more effective over time. Customer engagement, enhanced customer service, and customer experience these are few of the drivers that persist in the existence of chatbots. These are being used by various power brands as a potent marketing tool.

The clothing company and mighty brand H & M have chatbots application on their website, and the consumers are queried about the style of clothing they opt for and accordingly recommends outfits that fit the customer requirements.

• Chatbots aid to sell products and services producer offers to the consumer in an effective way.

• Chatbots succor the financial transactions and help consumers to handle payments in fewer clicks.

• Business Intelligence embedded helps chatbots understand and predict the customer behavior patterns, and congregates the customer insights to provide customers with the information of their choice. The customers are equipped then to take an informed decision.

• Personalization is an effective marketing strategy that inspires customer loyalty. Chatbots help to endow the end user with a personalized impact. Building a relationship with the consumer even after the purchase of the product is important to achieve customer loyalty. Chatbots in Customer Service:

"Your most unhappy customers are the greatest source of learning" as very truly put by Bill Gates, a customer always looks for the unmitigated combination of quality, efficiency, service, and reliability. An effective customer service is, therefore, to make our customers understand they are valued and appreciated by the organization. With the increasing accessibility of the social media, and advanced speeds internet made available, it is an effortless move for the customer to assert an opinion or an expression via the platforms that provide huge odds to get disseminated further to a larger audience. The compass of the chatbot expertise in the area of customer service accosts to circumstances where the customer concerns are realized. They are solved by troubleshooting or by evolving customer education cases where scripted answers are constructed. And thereby a process of machine learning and artificial intelligence enable further enhanced solution giving the ability to conquer every consumer problems with higher accuracy rates. In comparison to the other service channels such as customer care or IVR, chatbot enables a very cost and time effective way to address the customer concerns.

Humans depict emotions and empathy is a phenomenon that aids to deal the scenario of concern, and it is with no doubt hence that the chatbot designed systems can be installed to answer the basic queries; wherein a complex situation can be forwarded to human-aided services. Increasing consumer base and

awareness, especially on the digital platforms, benefits the ease of the access on both the ends. The future positioning of chatbots would be instilled in the drive of technology advancements in digital customer. It has the ability to shift the boundaries of competition to future pinnacles.

Chatbots Market in India

Chatbots which have implicitly have made their standpoint as a basic necessity for every flourishing enterprise. The messaging application has overthrown the social networking platforms as the times advanced paving way for increased opportunities to the chatbots. The chatbot ecosystem is briskly

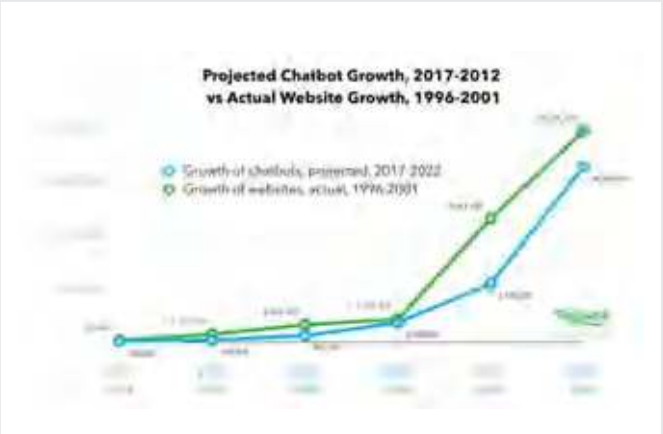

Fig 1. Projected Chabot Growth vs Actual Website Growth. (Source: Chatbots Magazine)

Augmenting and its underlying technology and arenas encompass deployment channels, native bots, technology enablers, and third party coalitions. According to the report by the Grand View Research, the global market for chatbots is estimated to hit $1.23 billion by 2015, with a compounded annual growth rate of about 24.3%. Also, the estimates reinforce the fact that chatbots are expected to mitigate the operational expenses to the organizations. These yield services in various industrial sectors in the domains of marketing, payments, service. Within the potential market such as India, consumers that approximate to 45% of the end users prefer chatbots as the primary channel of conversational interface with the organization. As per the survey conducted by Oracle, 80% of the respondents had a prior experience with a chatbot or have an enthusiasm to encounter with one by 2020. 42% of the respondents of the survey have an optimistic outlook towards the usage of automation technologies. Companies of varied scale are now innovating and redefining themselves with technology as their support to make the mark. From the service provider's perspective, reports estimate to see an overwhelming growth of investments chatbots that are being accounted to about $8 billion. The huge leaps made by the brands like Facebook, Google, Microsoft, Apple are blazing ahead with innovation as a gadget to success. The right technology accompanied with the suitable design with a pinch of innovation can build a chatbot that could do wonders for customer lifecycle. India is a country with varied languages, English being used by a minor percentage of the population; the challenge thus is to reach out to the consumer in their own language. According to a study conducted by KPMG and Google in 2017, the non-English internet users are estimated to grow by 18% by 2021. Chatbots are striving to provide solutions to linguistic concerns in parallel to the prime technology that is required at the heart of the chatbot.

Anatomy of a Chatbot

Building a chatbot with an extremely cost-effective way is important to ensure the optimum return on investment beyond the bells of the customer-centric approach. The major components that a chatbot consists of are:

- Backend
- Channel
- Natural Language understanding
- Conversational Intelligence
- Integrations
- Control Panel

Two major options chatbots present to an investor are either to go ahead with a custom solution based platform or building a chatbot on top of a platform. The latter is a more cost-effective technique, and such tools work on a subscription basis and are also time

Fig 2. Types of Chatbots. (Motion.ai subscription pricing)

effective. Individual implementation of elements of chatbots costs approximately $35,000. But the leaps of progress in this field has been immense with the launch of several platforms and incubation projects that help build a chatbot at a twice cheaper price and 16 times more accelerating speeds depending upon the solution to be employed. Artificial Intelligence flight in the chatbots has been rapid and to build an AI supported chatbot starts from $40,000 and can go up to $100,000. These kinds of chatbots are built to enable customers with more of a personalized and customized experience along with a complete business-enabled solution.

Cost-Justifiable Bot

The utility chatbot renders is supported by its cost-effective structure which is under the inspection of every investor. Costs incurred to maintain human service representatives are high when compared to that of fabricating a bot. All the brand titans favor out-sourcing of the call center workforce for customer service, but costs are substantial in this system as well. Installing a chatbot requires a single large investment genesis, and that balances through time, with negligible maintenance expenditure providing room for immense finance potential. There are many success stories of brands that have captured bouldering figures of ROI, one of them being "Much chats". With re-directing the traffic from a Facebook page, this blog messenger has acquired an ROI of 400%.

Fig 3. Savings created by Chatbots. (McKinsey estimation report 2016)

Fig.4. Key Statistics for Chatbots. (Juniper Research)

This is primarily because, chatbots are on service 24 hours a day, 7 days a week, 52 weeks in a year-round the clock under no pressured requirements for vacations, appraisals. As per studies, in 2016, there are more than 30,000 chatbots installed in Facebook messenger. The chatbots' ability to respond to the user commands in a minimalistic time frame is essential to magnify their functionality.

How Secure are Chatbots?

With tremendous potential in sales, marketing and customer service chatbots have quickly being embraced by business to improve service quality and automate certain processes to save money. With the advancement of artificial intelligence and machine learning, chatbots have been fuelled by an exponential growth over the year. More than 20 million people chat with xiaocia bot on the Chinese micro-blogging service Weibo. It is estimated that 80 percent of business wants chatbots by 2020. However, with increasing deployment of enterprise chatbots, it's important to consider security implication of this promising technology.

While the technology is continuously improving over the year, still it is not entirely secure. Bots can create an easy way for cyber criminals to access the data flowing through chatbots interface which allows a cyber-attacker to access network and database of the organization. Therefore security needs to play a large role in such platform where customer's data is at stake and it becomes easier for the hacker to break through the security walls if your technology is not secure enough.

Encryption is one of the key parameters of any online function to ensure the maximum security of chatbots; communication should have encryption all the time whether it is on a public or private platform. It can be easier for a private platform to have its own encrypted channel but it becomes difficult for a public platform where security features are decided by third-party security branch i.e. organization do not have control over the security features. Till the time public channels do not offer encryption services organization should be aware of the type of chatbots they are employing, companies use bots to collect the information from the user and use that information to improve service quality. While extracting the information from the users there should be regulation on how this information is stored and it is going to access.

As chatbots have become better at every stage to imitate humans, technology has already drawn the attention of hackers in phishing schemes. Therefore organization should start defense mechanism against the traditional phishing. Specific security protocols are being developed to deploy bots on a public platform. With the tremendous potential to transform online business, chatbots are quite destructive causing cybersecurity nightmare for the organization. At the early stage, it is important for the organization to be aware of the frenzy surrounding and deploy bots on a public platform.

Illustrations of Chatbot Realizations

1.Company: Rapid Miner
Chatbot System: Drift

Rapid Miner as the very first step renewed all the lead generation systems of the organization's platforms to chatbots. It became quite evident that automated customer care possesses the ability to qualify leads in minutes, compared to the other types of campaigns which significantly amount to more amount of time. Customers visit the website with various prospects, it could either be product inquiry, technical support or order tracking, chatbot implementation could enable a process that filters other queries with the ones from which leads are expected. The drift bot manages about a thousand chats a month with almost resolve two-thirds of the entire queries, the rest getting forward to the human agents. As far as the statistics are concerned, drift was successfully able to bring in 4,000 leads, influencing 25% of the open sales pipeline and has recorded 10% of the new sales.

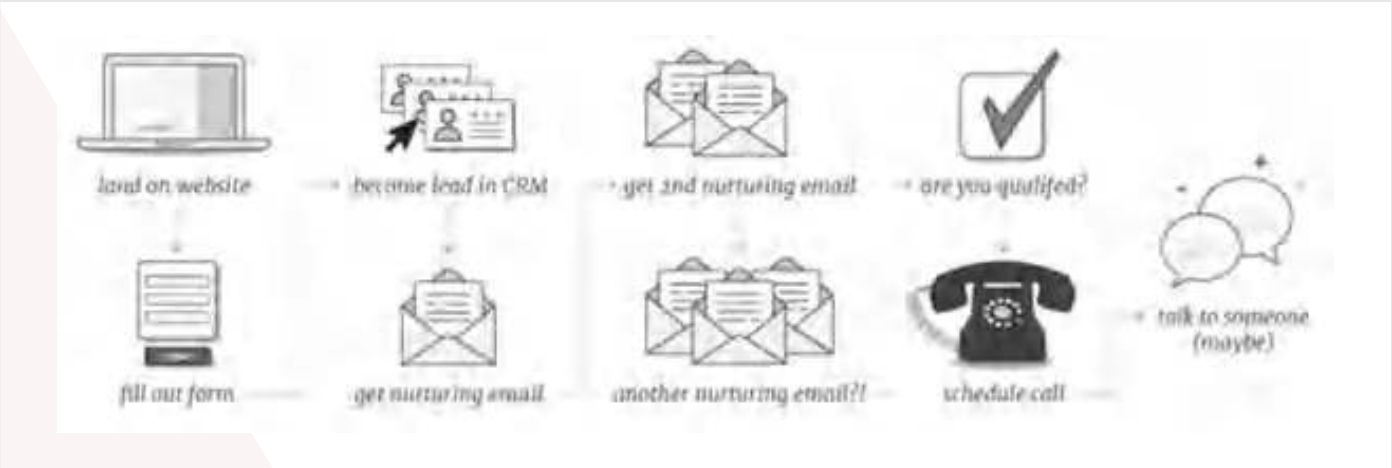

Fig 5 Basic approach of Rapid miner

2.Company Name: Vodafone UK
Chatbot System: Tobi

Tobi offers immediate support to practically 70% of the customer queries, continuously enhancing it's learning the process that endows heights of customer experience. Tobi is built on the latest AI technology that can provide customers with seamless problem-solving capability along with a swift switch to human systems in case of complicated queries. Customers have reacted positively with respect to the speed and simplicity. Impending in the future, Tobi is geared up to expand the range of support and also fully integrating with the systems of Vodafone to allow the service providers to focus on higher quality conversations.

Fig 6 Interface of Tobi

The Evolution in The Future

Since the time Facebook launched chatbots in 2016 for the first time, chatbots have been developed over a period of time.80 percent of companies have already implemented or have planned to implement it by 2020. Companies believe that automation will help improve ease of customer and reduce labor cost. Bots will replace 29 percent of employees which will result in $29 billion in savings annually and hence will attract many businesses.

Majority of the population between ages 18 to 55 spends time on messaging applications; therefore, it is easier for the company to appeal to younger and demographic generation. Bots are found to be a more effective channel for advertisement. It is easier to build rapport with the customer so that customer can understand brand more easily. This provides an innovative and convenient channel for advertising directly to the customer. Bots can offer a more personalized experience to the user by offering customized advertisements by remembering the personal choice of the user. With the continuous advancement of the mobile device and sense of companies efforts to deliver excellent customer experience as a competitive differentiator. To differentiate itself from other, business has come up with video chat for customer interaction; this will provide a richer experience to the user. Also, the exploratory growth of IoT and use cases will bring transformational change.

Conclusion

Arriving into a chatbot market is effortless with very mild barriers. It is substantially undemanding for a business of any scale to build a chatbot enabled feature on to their platform. A thorough example is the Facebook Messenger, which provides a benevolent platform, enabling the deployment of a chatbot in an ingenious way. Chatbots are just the means that help deposit information, but they help in developing leads. Versatile conversations that keep evolving enable bot to become smarter. Possessing a unique functionality is might not be the prime focus, as the preliminary requirement is to solve customer's troubles. Messaging interfaces are just a way to reach out to customers in an effective way, these could be further developed with advancing technologies to bring out a much superior service to embellish customer experience. The road ahead for Chatbots depends on the degree of flexibility and responsiveness it offers. Efforts are being made to equip individual chatbots with a fun personality and interact verbally to consummate perfect tailored responses.

Customers are looking for an option that integrates both flexibility and speed with near real-time data that contributes to their evolving needs. Enterprise AI is a new trend that has been looked upon to address the budding automation technologies. Smart technologies that transform the vision of the future and solve customer problems end to end are requisite.

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Vaishnavi Pisipati

Feature Phones - Next Big Thing?

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Abstract

While the invention of smartphones took the world by storm, India, a rapidly developing economy still has a huge segment for feature phones. With manufacturers investing "smartly" in both the feature phones and the smartphone production, what could be the possible reason that major players that were earlier wiped out from the market are making a comeback in the market by means of features phone? This research paper analyses the factors that contributed to the shift of consumer from feature phones to smartphones and why some still continue to use feature phones even today. Paper uses qualitative analysis and presents a detailed study to explain the market preference for feature phone over smartphone.

Keywords

Feature phones, PPM framework, GAME framework, marketing strategy, consumer behaviour analysis.

Introduction

India is known to be the most price sensitive and hyper-competitive market. The introduction of feature phones into the market was a revolution, and was a sensation not only among corporates and working class but also within every household. In the early 2000s each household had replaced their PSTN phone with a feature phone. In 2008 India became the second largest wireless network after China and the teledensity for wireless subscribers increased from 33.69 million to 261.07 million (2004 to 2008) whereas the broadband subscribers stood at 38.7 lakhs (TRAI Annual report 2007-2008, 2009).By 2010-2011 the wireless subscribers saw an increase of 107.58 million subscribers whereas there was a decline of 2.56 million subscribers for broadband subscribers. As a result the market for feature phones flourished and going by the total population of India in 2011 which was 124.7 Crore, 65% of the population had a feature phone (TRAI Annual report 2011-2012, 2013). What started out in the market as a device for calling has now transformed into a handheld smart device that has enabled not just voice connectivity but also data connectivity enabling user to use numerous applications. Even as smartphones began taking over the market with its technological advancements the Kantar IMRB & MMA report, 2016-17 states that as big as 85% of the urban population still uses feature phones (TRAI Annual report 2007-2008, 2009). The return of Nokia with its famous model 3310 with vibrant colors and modified features helped it gain 8% market share at its launch. Nokia came up with the concept of craftsmanship along with innovation to achieve such results. Under this program, which was launched in China the idea was to launch products that are integrated with internet thinking – providing phones that enable connectivity anytime, anywhere and to anyone (As quoted by Alibaba's Chief Strategy Officer Ming Zeng) (Xinyu Zhai and Lei Zhao, 2017)(Jeongwen Chiang, 2014).With estimated shipments of mobile phones being 270 million in 2017, feature phones still constitute 140 million devices out of the total resulting in a market share of 52 % while smartphones stand at 48% (ZeeBiz WebTeam, 2011). The release of affordable 4G feature phones by Jio is said push this number. The launch of Jio phones has already gained a total market share of 26% post its launch in Q4 2017 whereas Samsung feature phones have 21% market share for the overall year 2017 (ZeeBiz WebTeam, 2011).

Fig 1.Market Share of Feature phones and Smartphones (Mobile Marketing Association, 2016-17)

This only goes to prove that feature phones are leading the market. Jio which has come up with its own range of affordable 4G feature phones will also play a major role in increasing the market share of feature phones overall. If OEM's came up with a new type of feature phone on similar grounds, with some modified specifications it may lead to the creation of a whole new market segment resulting in need creation for feature phones in the market.

The below figure clearly indicate that Nokia's strategy

to launch feature phones worked in their favour with acquisition of 26% market share in Q4 2017 itself. Hence we can derive that there exists a huge market for feature phones that can be catered to. If businesses came up with a new type of feature phone with some modified specifications it may lead to creation of a whole new market segment.

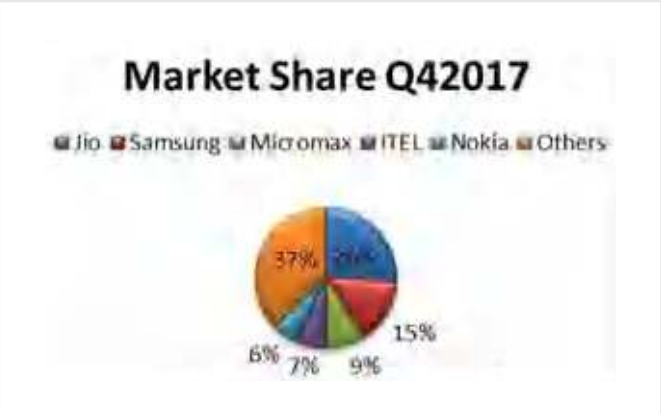

Fig 2.Market Share of Feature phones Q42017 (ZeeBiz WebTeam, 2011)

Fig 3.Market Share of Feature phones CY2017 (ZeeBiz WebTeam, 2011)

This paper aims at identifying factors that have contributed to loyal consumer base for feature phones. This paper also looked at various possible modifications possible either in the form of specification or marketing tactics that can be adopted to improve the given consumer base for feature phones and why big brands still invest in feature phones. The Push - Pull framework (Bogue, 1969; 1977) later extended to Push Pull Mooring framework was primarily developed for human population migration research purpose

Framework used for analysis

In the paper we have used two different frameworks. The general idea behind PPM framework – Push, Pull and Mooring (Jouni Piispanen,2014) is to identify factors that play major role in attracting or driving away consumers to feature phones whereas GAME framework (Vince Law,2017) focuses on how we can evaluate our product based on four major aspects – Goal, Action, Matrix and Evaluation.

PPM

In "The Roles of Social and Network Effects in Consumer´s Mobile Service Platform Switching" by Jouni Piispanen, 2014 the PPM framework was applied to analyse switching behaviour of consumers from feature phones to smart phones. This paper aims to use the same framework to analyse why consumers still use feature phones.

Push Factors -

These are the factors that enable consumer migration from one service to another or from one product to another when dissatisfied by the current product or services. These account for all possible perceived negatives of a service or a product leading to loss in consumer base for the given service or product.

Pull Factors -

These are factors that attract the potential consumers towards the given service or product facilitating migration of consumer from his or her old service or product to the new service. These account for all possible perceived positives about the new service or product that the consumer is drawn towards creating a new consumer base for the new service or product.

The Push and Pull factors form part of the logical migration decisions for a consumer.

Mooring Factors -

These factors are related to a consumer's personality and his surroundings such as cultural factors, social factors etc. These are more related to a consumer's lifestyle and social image. These factors affect the consumer's decision in switching behaviour and may not be push or pull factors on their own.

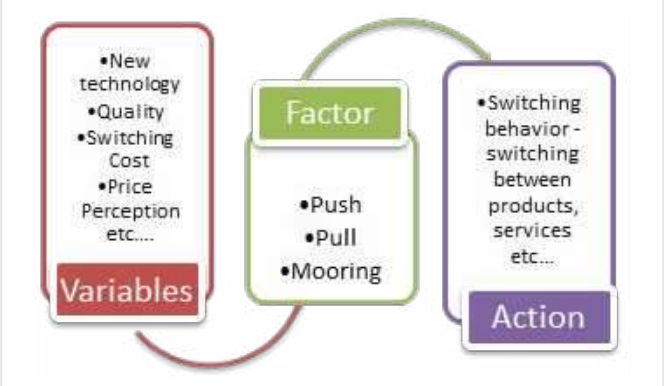

Fig 4.PPM framework (Ref PPM framework for service migration (Bansal et. al., 2005))

Push Factors –

1. Technological Changes and Alternative attractiveness – Invention of touchscreen in case of smartphones better display, increased number of applications.

2. Shift in trend – Going with the trend consumer chose what was best available and feature phone became the choice of senior citizens who were not ready to accept change as compared to the remaining population. A study by the Kantar IMRB reports from their survey that almost half of all respondents they spoke to were aged 35 years or older (TRAI Annual report 2011-2012, 2013).

3. App Store – Unlike feature phone which has in built apps, smartphones have infinite number of apps under varied domains such as games, entertainment, knowledge etc.

4. Word of mouth – Praises of smartphones spread like wildfire from one consumer to other increasing its demand drastically.

Pull Factors –

1. Low cost – A 4G enabled feature phone with only the essential applications is more preferred than the smart phones. For eg. The Lava International (mobile manufacturer) which will sell 4G feature phones at a competitive price compared to low price smart phones (eMarketer, 2017).

2. Ease of use – Feature phones are manufactured for the ease of use, considering the rural population, the younger generation and the senior citizens who use phone for basic purposes like calling, data browsing, video, music, etc. the screen size is not as big as that of the smart phones and key pads are equally spaced for ease of use and touch screen is also avoided for the same reason.

3. Long battery life – As feature phones have only necessary applications, the phone has a long battery life and it also requires less bandwidth as compared to other smart phones.

4. Security – Compared to smart phones security is not compromised. Smart phones are always connected to network as it has apps which needs internet to run huge applications. This makes feature phones more secure (Woongryul Jeon, Jeeyeon Kim, Youngsook Lee, and Dongho Won, 2011).

5. Response speed of device – As feature phones have simpler hardware as compared to smartphones and do not process huge amount of information as compared to smartphones the device is comparatively better in speed than any smartphone. Lesser the functions better the performance.

Mooring Factors –

1. Switching Cost – There is high cost incurred while switching between feature phone and smartphone. This might probably be the reason why a market such as India is still using feature phones.

2. Concerns of learning – Majority of the senior citizens find it tedious to learn so many functionalities of a smartphone and prefer using feature phone with limited features that serves the basic purpose.

3. Personal concern – A minor part of the population prefer retaining feature phone as their choice of phone. The report by Kantar IMRB reports that only 15% of the respondents they surveyed definitely intended to switch to a smartphone (TRAI Annual report 2011-2012, 2013).

4. Digital Detox – Under this we broadly classify any behavioural factor that refrains the consumer from using digital devices such as smartphones or computers were excessive use of these may be significant contributor to alignment such as stress, hypertension etc. Digital detox focuses more on using a device on need basis and not on regular basis, along with a nudge towards increased physical world interactions as opposed to interactions via social media.

GAME

The GAME framework is a simple framework and one of the easiest ways to analyse a product.

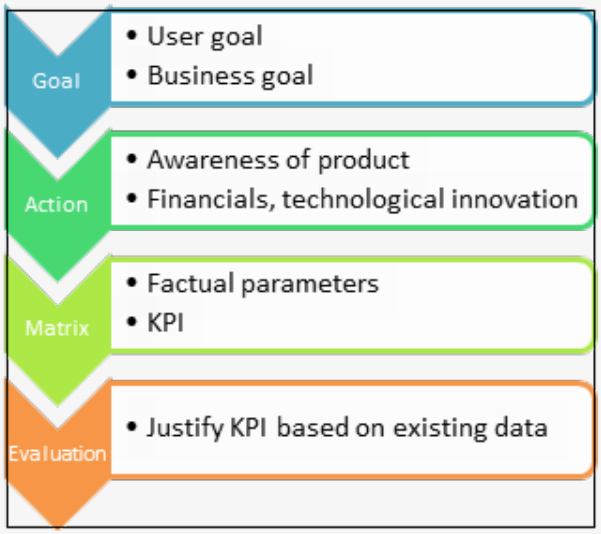

Fig 5.GAME framework (Vince Law, 2017)

Product Analysis using GAME framework – Feature Phones

Timeline	Before Smartphones	Launch of Smartphones	Current Scenario
Goal	Capturing landline market segment. Mobility on the go calling feature for consumers.	To survive and maintain some market share	To target cost sensitive/low income consumers
Action	Rigorous marketing Competitive environment	Heavy discounts on feature phones	Change in marketing strategy and really low prices
Metrics	Sales, Profit, Market share, Performance of device.	Number of users, Life time value, tenure	Cost of the product, Number of features provided by the product, retention or percentage change in market share as compared to previous figures
Evaluation	Evaluations will be based on the data of the metrics defined to perform the particular action to achieve the goals mentioned above in each case. At certain stages we may find the above mentioned actions, metrics or goals may vary. (as of now we don't have the data to evaluate the above goals, actions and metrics)		

Conclusion

Based on the market share we can conclude that feature phone is mostly being targeted at the low income strata of the Indian population but with a modified marketing strategy it can be projected as a phone that can perform as good as any smartphone. With long battery life and better security features it could bring in a lot of new consumers for the segment. Some prominent companies that had died have decided to revive their business with launching feature phones. They are the next new 'cool thing' to have and with right blend of marketing and strategy it could be the next big thing.

Major reason which was stated in the report as to why people still use feature phones were– affordability, long battery life, ability to use social apps such as Facebook and WhatsApp, Government enabled UPI interface for the digital transaction and fund transfer.

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Green Wireless Telecommunication: Shift Towards 5G network

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Abstract

With the rapid growth and evolution of information and communication technology, energy consumption is also growing at a very fast rate. It has also been reported mobile operators are among the top energy consumers. The energy consumption is growing even more with the deployment of 4G systems worldwide. Thus, there is an urgent need to shift from pursuing high capacity and spectral efficiency to energy efficient design. By reducing power consumption of wireless networks, we can improve their energy efficiency. The energy efficiency of 5G networks is expected to be increased 100x times from 1000 mW /Mbps/sec in IMT-2000(International Mobile Telecommunication) to 10 mW/Mbps/sec in IMT-Advance and future IMT (Akshita Abrol,2016)

Energy efficiency is becoming a matter of great concern in the telecommunications community due to a number of reasons such as huge data rate requirements, increasing price of energy, ecological impact of carbon, pressure and social responsibility for fighting climate change. Main focus is on relaying techniques between the Base station and the Mobile stations as a means to reduce the power consumption as well as to save the operator from incurring the huge cost of deployment of a new base station. (WILEY's Text Book, 2015) (Akshita Abrol, 2016)

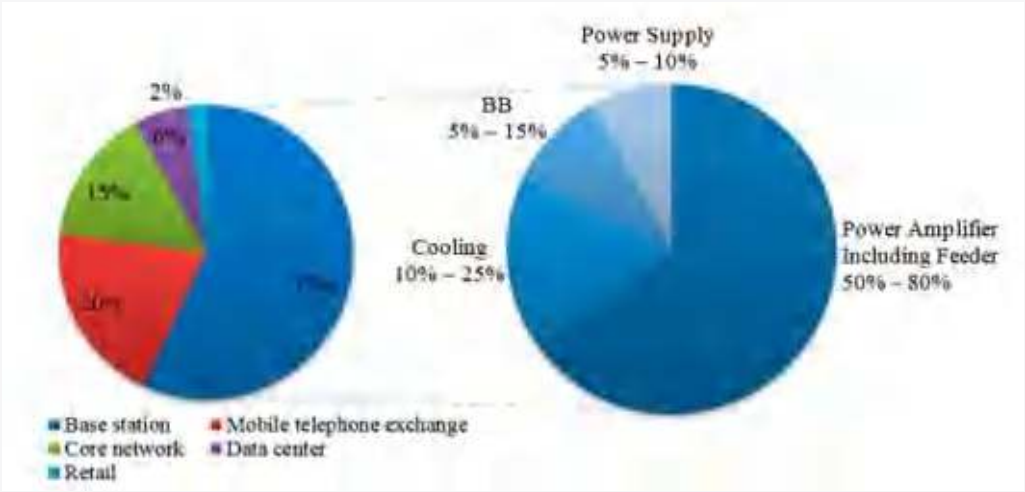
From the users' perspective as well, energy efficiency is the need of the hour. The battery capacity is increasing only 1.5x per decade and has always been a concern for the user. In the future networks, there will be unbounded access to information and sharing of data everywhere and every time with the ever-increasing number of energy hungry applications. Therefore, to satisfy users' demand of battery life, energy efficiency in wireless communication is imperative. Another factor under consideration is the health concern of the user. High power radiated by handsets while in use tend to harm the user in close proximity. Hence, shifting towards more energy efficient techniques becomes all the more important. (Akshita Abrol, and Rakesh Kumar Jha, 2016)

The need for adopting green communication has been realized worldwide. There is a focus on following holistic approach for power optimization. The next generation architectures focus on developing new technology, cell deployment strategies and resource allocation policies to improve the energy efficiency of a wireless communication network. (WILEY's Text Book, 2015)

Rise of Fifth Generation (5g)

The 4G network soon will be replaced by the next generation 5G network to meet the increasing demand for high data rate. To meet the demand of the subscribers, improvement in the energy efficiency of the next generation networks is imperative. Green communication will play a major role in this. 5G includes techniques like Massive MIMO, Beam division multiple access, D2D communication and use of multiple radio access technologies. The power requirement of the network increases with the frequency in use. The prescribed safe RF exposure limit according to ICNIRP guidelines expressed in terms of power density (watt per square meter) is f/200 where f is the frequency in MHz. To maximize the efficiency upcoming systems, the scheduling of time and frequency resources needs to be coordinated with the power optimization techniques. The future networks providing even more data rate will require more such power saving techniques. (Akshita Abrol, 2016)

Fig 1. 5G Ecosystem (5GM Research Lab, Czech Technical University 2017)



(a) Power consumption of a wireless cellular network (b) Power consumption distribution in a BS.

Fig 2. Breakdown of power consumption in a cellular network and BS (Wu, J, 2015) (Hasan, 2011)

Energy Efficient Techniques in Telecommunication

To make the network energy efficient, we have various ways like forming energy efficient architectures or using energy efficient radio technologies or obtaining energy efficiency in resource management. We concentrate our attention on power optimization using **SWIPT, MILLIMETER WAVES, MASSIVE MIMO, C-RAN, SMALL CELLS** and their integration with 5G network.

1. Simultaneous Wireless Information and Power Transfer (SWIPT)

Recently due to greater demand of energy efficiency in wireless communication, there is a lot of interest of integrating energy harvesting technologies in wireless communication system. The upcoming technology is WPT (Wireless Power Transfer) where nodes charge their batteries from electromagnetic radiations. (K. Huang, 2013)

Strong signals increase power transfer but at the same time they also increase the amount of interference. This technique can be most useful in the case of sensor node or for the upcoming technology of Internet of Things in which the control signals will be used to charge the access point. The future networks will overcome its problems of path loss with the use of MIMO, small cells and mm waves. The element used for this purpose is a Rectenna, which converts microwave energy to direct current. This is achieved by splitting of the received signal to two orthogonal signals. SWIPT involves modification in the existing communication system. There can be three scenarios where we use SWIPT:

• Near field scenario: Power is transferred using inductor or capacitor coupling and up to tenths of watt can be transferred with a range of 1 m.

• Far field Scenario: Power is transferred using directive power beaming with directive antennas up to mW and range of several meters.

• Far field low power scenario: Power is transferred with RF power scavenging up to micro Watts with range of several km

This technique can be used in wireless charging of relay nodes, which are power, constrained. In 5G networks, with the coming of Massive MIMO technology more and more stray RF signals will be available which can be harnessed at the relays to harvest power. SWIPT as discussed is more successful in the near field scenario. (I. Krikidis, 2014)

2. Millimetre waves

Millimeter waves are expected to be one of the most promising technology of 5G. It is expected to solve the problem of bandwidth allocation for faster delivery of high quality video and multimedia content. With the growth of wireless industry, the demands of the consumer are increasing day by day, which may lead to the problem of congestion of the network by 2020. To overcome this in 5G, the wireless signals are being moved to a higher frequency band operating at millimeter wavelength between 30 and 300 GHz on the radio spectrum. The data rates are expected to increase to multi gigabit per second in the future. However, with the shift towards millimeter range, there will be high path loss and signal attenuation leading to limited communication range. (Y. Niu, 2015)

As the millimeter, range wavelength is very small, so it will utilize spatial multiplexing techniques for both transmission and reception. Massive MIMO will play a major role in the millimeter range. Appropriate signal processing techniques such as adaptive beamforming will enable the transmitting node to direct signal towards the desired receiver. Hence, steerable array antennas will be used in millimeter range spectrum to obtain high data rate and capacity. (T. S. Rappaport et al, 2013)

3. Massive MIMO

In the 4G systems, MIMO is the key technology used to increase network capacity. It provides both diversity gain by sending the same signals through different paths between transmitter and receiver antennas as well as multiplexing gain by transmitting independent signals in parallel through spatial channels. Both also help in reducing energy efficiency (W. Liu, 2005). If the relation between transmission distance and energy consumption for SISO, SIMO and MIMO is compared, there is no doubt that MIMO consumes more circuit power due to more number of antennas (S. Cui, 2004). Therefore, it is beneficial for longer transmission distances. However, practically users are equipped with single antenna. So to overcome this limitation virtual MIMO also known as MU-MIMO has been proposed.

In 5G networks, a variant of MIMO is proposed in which a very large number of antennas are employed at the base station called Massive MIMO. Using this technology, the base station can communicate with multiple users simultaneously in the same frequency band hence providing high multiplexing as well as array gain at the same time. Massive MIMO technology is not only spectrum efficient but energy efficient as well. It is revealed that transmit power is decreased by the number of antennas at the base station so as to get same data rate like single antenna systems considering channel state information is known. (H. Q. Ngo, 2014)

Besides power scaling law, the ways for improving energy efficiency in Massive MIMO systems have also received considerable attention. The energy efficiency decreases with increase in spectral efficiency with perfect channel state information has been shown. Whereas with imperfect channel state information, the energy efficiency increases with spectral efficiency in low power region and decreases in high power region. It is obvious that there are a large number of antennas in Massive MIMO, which consume high circuit power hence causing considerable reduction in energy efficiency. Technique of switching off some of the base station antennas is suggested similar to MIMO to improve the energy efficiency of the system. (E. Björnson, 2013)

4. C-RAN

C-RAN is an acronym gaining popularity in the wireless industry, though it refers to two different meanings. The first meaning is centralized radio access network, while the second meaning is cloud-based RAN. Both meanings are related concepts and involve a new architecture for network equipment at cell sites. Cloud-based RAN is a novel mobile architecture that has the potential to handle as many base stations as the network needs using the concept of virtualization. In C-RAN, the baseband and channel processing is virtualized and shared among operators in a centralized baseband pool. Such centralization and sharing allows for more dynamic traffic handling and better utilization of resources including base stations deployments. Such architecture would have the potential to decrease the expenses cost as base stations are virtualized instead of physically deployed in different areas. In addition, it reduces the energy and power consumption compared to traditional networks due to the fact that base stations will be located on the same physical device. (L. Chen, 2014)

The C-RAN architecture is designed to allow mobile operators to move the baseband processing unit to a central location in support of multiple remote radio heads. Until recently, the BBU was almost always located on-site near the bottom of the cellular antenna. C-RAN offers mobile operators the possibility to centralize multiple BBUs (Baseband Unit) in a single location, either at a cell site or at a centralized BBU pool location. This allows telecoms to simplify the amount of equipment needed at each individual cell site, among other benefits. The deployment of a C-RAN architecture also allow operators to save money, as it can cut costs in at least two ways. First, real estate is almost always less expensive at a data center location than at a cell tower site. Through this architecture, mobile operators can consolidate base station equipment for multiple cell sites at a central office or data center. Second, power loss is much lower with fiber than with cable, so the fiber connection associated with C-RAN can reduce operating expenses. 5G networks will need faster response times than today's LTE networks as it includes connecting critical machines (M2M) as well as personal mobile devices. Therefore, C-RAN can lay the groundwork for the future 5G networks. (China Mobile Research Institute, 2011)

5. Small Cells

Small cells are an umbrella term used for operator-controlled, low-powered and low-cost base stations operating in licensed spectrum. They can be densely deployed in order to provide high data rates. Small cells can be of different sizes depending on which they are classified as: -

- Femto cells (up to 100 m)
- Pico cells (up to 200 m)
- Micro cells (up to 500 m)

Small cells can have a centralized base station or remote radio heads which can be wired or wireless with core network. They reduce the distance between the user and BS hence also reducing the transmit power required to overcome the pathless especially in the indoor environment hence improving the Energy Efficiency of both uplink and downlink communication. There is a Small Cell Access point, which will be installed on buildings and will communicate with Base Station. The Mobile Stations located inside the building will only need to communicate to the SCA and not to the far located base station hence decreasing both the load and power requirement. Deployment of Small cells requires minimum changes in the current standard and can save a lot of user's battery consumption. The trade-off between traffic offloading and energy consumption can be implemented through BS sleeping strategy (To improve EE by switching off small cell base stations (BSs) or keeping them in energy-saving mode while preserving the quality of service (QoS)).(A. Prasad, 2013)

Energy saving by different techniques:

(Akshita Abrol, 2016)

S.No	Technique	Energy Efficiency
1	SWIPT	30%
2	Beam steering (4 antennas)	55%
3	Small Cells	11.1%
4	C-RAN	21.2%
5	Massive MIMO	30.7 Mbit/J

Current projects in energy efficiency in wireless communication

S.No	Project Name	Year of Initiation	Aim of Research	Area of Research	Reference (URL)
1	5GrEEn	January 2013	To design environment friendly 5G mobile networks	Efficient mobile access networks and backhaul solutions	https://wireless.kth.se/5green/
2	METIS II	July 2015	To develop the 5G framework with efficient integration of various technologies	5G radio access network design and developing an open –Source 5G evaluation and visualization tool	https://5g-ppp.eu/metis-ii/
3	Green Wireless Communication	2013	To lower energy consumption of future wireless radio systems	Development and performance analysis of new wireless channel estimation techniques, Transceiver design optimization under uncertainty and BS sleeping strategy.	https://sri-uq.kaust.edu.sa/pages/greenwireless.aspx
4	Greene	July 2011	To analyze, design and optimize energy efficient wireless communication systems and networks	Cooperative communications, cognitive networks and network coding.	http://www.fp7-greenet.eu/default.php
5	Green-Touch	2010	To deliver the architecture, specifications and roadmap to increase network energy efficiency by a factor of 1000	Energy efficient cloud, optical networks and home networks.	http://www.green-touch.org/
6	OP-ERA-Net2	December 2011	To reduce the overall environmental impact of mobile radio networks by extending the results of OPERA-Net project	Energy and material efficiency and use of renewable energy for telecom networks.	https://www.celticplus.eu/project-opera-net2/

Future Challenges

The next generation networks are expected to meet the needs of the consumers along with providing a solution for green communication. Use of new techniques such as SWIPT, massive MIMO, mm wave as well as continued use of small cells and relays in the next generation networks will impose new research challenges.

SWIPT is a promising technology for future but has unsatisfactory results for longer distances due to high path loss. Spatial diversity can be used to overcome this path loss. Thus, use of massive MIMO along with SWIPT need to be investigated for better results. Also, efficient circuit modules need to be developed, which can reduce the power splitting loss as well as cost of the hardware.

Energy efficient resource management helps in saving huge amount of power. The handoff and coverage issues between neighbouring small cells and its impact on EE needs to be further estimated. The QoS requirement of a particular application and time varying channel condition and its relation with EE needs to be developed.

The next generation networks are expected to support heterogeneous networks. So, interference management as well as handoff between various networks with respect to EE needs to be studied. The trade-off between spectral and energy efficiency for heterogeneous networks also needs further investigation. The EE of massive MIMO network with full duplex relay channel needs to be studied. The EE of massive MIMO in multiple cell scenario needs to be investigated to eliminate the effect of interference.

Further research also needs to be carried out for efficient implementation of base station sleep modes to save maximum possible power. The power allocation strategy by base station to small cells and its impact on the energy efficiency of the network needs investigation. The power control strategy and efficient algorithm in D2D communication to minimize interference at the same time ensuring optimum SNR needs to be developed. The trade-off between power consumed by hardware and power saving of the network by using massive MIMO with beam forming in the millimeter range also needs to be investigated along with the overall energy efficiency of the network.

Conclusion

We have discussed the growing need for energy efficiency in the next generation networks. We have analyzed the trends in the field of wireless communications in the last decade, which indicated a shift towards pursuing green communication for the next generation network. The importance of choosing the appropriate EE metric has also been discussed. Further, we have gone through the various techniques, which can be used in the future for optimizing the power of the network and the presented, a summary of the work that has already been done to improve energy efficiency of network using these techniques. EE techniques such as Massive MIMO, C-RAN, SMALL CELLS and SWIPT have been briefed and few projects undergoing on Green Communication was mentioned. Various challenges for future research for improving EE of wireless network have also been discussed.

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Heterogeneous Networks and Small Cells: Optimization and Improvisations

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Abstract

With the implementation of Heterogeneous networks, which encapsulates RAN functions with micro cells, small cells and Wi-Fi functionalities, the demand for indoor High-Speed data and Voice over IP Services has been fulfilled. But, mobile data traffic is predicted to grow by up to 50% by 2020. To accommodate the increasing traffic growth, operators need substantial amount of optimization and improvements in the existing architecture of their HetNets. This paper describes a few infrastructure optimization techniques that can be used to overcome this high-demand data traffic, using the existing infrastructure. The paper also presents various RAN optimization strategies – Multi-carrier, Sectorization, Tilt Optimization, and Cloud-RAN, which will be very helpful in improving the capacity of existing HetNets.

Fig 1. Heterogeneous Networks & Small Cells

Introduction

Heterogeneous small cell networks have become the preferred deployment choice in the telecom market recently as they offer answer for exponentially growing data requirements of users and enterprises. HetNets, which are a combination of telecom nodes of different technologies along with different small cells, is something which will have a huge impact on the future 5G network solutions. In the meantime, 5G Network and IoT solutions have become essential factors in network planning. Many network players are entering the wireless market and operators need to consider other optimization options and discover more practical methods for deploying the number of small cells required to meet consumer demand. Nevertheless, as small cells are being deployed in such large numbers, multiple-channel interference and call-handover management are major problems which are being faced by cell edge users. In Section 2 network optimization techniques to extract the best capacity from existing networks is provided. Advantages of Radio Access Network and strategies used for its optimization has been described in Section 3.The way Telco's would procure cash using heterogeneous networks & small cells has been explained in section 4. (Claussen et al, 2017)

1. Network Infrastructure Optimization Techniques

Data and Voice services are made available by Heterogeneous Networks door-to-door. 80% of the traffic, be it call or data traffic, is generated from the in-door building and not from outdoor users. Also, with the decrease in spectrum available and with the increase in a number of mobile users, bandwidth

utilization should be taken care of. Below mentioned optimization techniques can help telecom operators:

1.1 Multi-Operator Cell Solution

The Multi-Operator cell solution combines a number of Radio cells which are shared by more than one telecom operators, where one operator manages the network while others operators provide frequency signals to the network– analogous to a distributed antenna system (DAS). This relatively new network solution manages up to a total of 4 operators to allow them to broadcast over a single cell; collaborating the multi-operator advantages of an active DAS solution with the high output, flexibility and low-cost design of the present small cells network system.

1.2 Multi-Cell Enclosure

Multi-Cell Enclosure solution combines multiple cells in a single frame. The enclosure has very less impact on building dynamics, and is very useful for multi-operator deployments, and provides a low-cost optimization option in societies or office buildings that charge per cell-box deployed, meanwhile extending coverage and capacity indoors using LTE/5G interworking.

1.3 Strand-Mount Unit

This is one optimization solution which is recommended for cells which take care of out-door traffic and which facilitates the installation of small cells on the current systems, on aerial coax cables, optical fibre, or on any other cables. Aerial-strand integrations are of utmost importance, to scale the outdoor cells and hence they can be integrated on both single and multi-operator networks. These solutions can also support up to a total of 4 microcells, enabling different operators to use the same mount for network integrations. The Strand-Mount Unit delivers good (provide statistics for evidence) outdoor coverage and creates new opportunities for outdoor deployments for telecom operators, cable operators, and tower companies. (Ericsson, 2017)

2. RAN Optimization Strategies

Set of activities that are performed in order to maintain or improve performance of active wireless communication activity are defined as RAN Optimization Strategies. Improvements can be defined in terms of any combination of coverage, capacity and service quality. Reduction in energy consumption along with CO2 emission and improved user experience backed by smooth evolution are major benefits of radio access network optimization. Before investing in any Optimization Technique, they look to get the best out their existing network. Here are few such strategies:

2.1 Multi-carrier

Operator can always check which carriers have available spectrum and are not being used efficiently. Bandwidth can be optimized by using the available spectrum of these carriers which will be beneficial w.r.t. both cost and capacity. There are many telecom vendors which use this technique. Airspan Networks have their AirSynergy 3000 small cell, which is a high performance LTE eNodeB small cell optimized for outdoor deployment in Heterogeneous Networks on non-traditional deployment locations. The AirSynergy 3000 eNodeB supports non-contiguous, triple carrier, LTE-Advanced Release 10 carrier aggregation in 2 GHz and 3 GHz bands, empowering it to provide end user internet speed of more than 300 Mbit/s. (Airspan)

2.2 Sectorization

Allocation of more and more sectors in an area also reduces the need of deploying additional cells, as they cover a good area. By this operators get a good capacity and coverage of their network.

Fig 2. Different Sectorization options. (Viavi Solutions, 2015, P 3)

2.3 Tilt Optimization

Another such strategy is antenna tilt, which reduces the interference. This technique increases the coverage of network by a substantial amount (by how much? Give references to any statistics), which is equivalent to

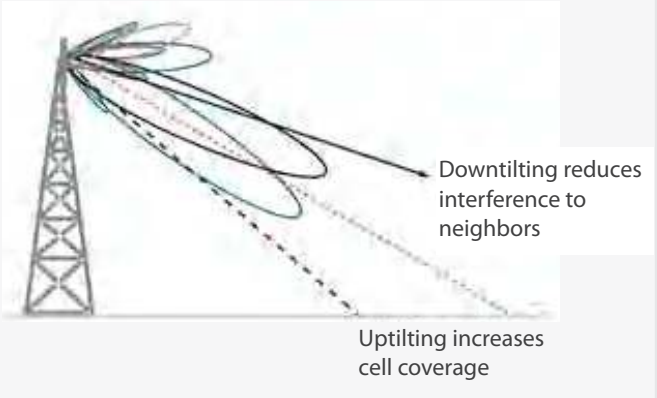

Fig 3. Impact of antenna tilt on network and coverage. (Viavi Solutions, 2015, P4)

putting any other optimization technique. This incurs a minimal cost in implementation and has a good impact on network strength and interference indexes. If tilt optimization is used along with remote electrical tilt (RET) antennas, this optimization is as good as self-optimizing networks (SON).

2.4 Cloud RAN

C-RAN has the capacity to convert itself in a distributed base-station architecture by pooling baseband processors in a central location and distributing remote radio head ends which are connected through the dark fibre to the baseband engines. C-RAN also provides some advantages in capacity and coverage where fibre is available in abundant. In this case, operators get benefitted by low cost, reduced power consumption, smaller footprint, and smaller maintenance cost.

Fig 4. Distributed Wireless base-station architecture. (Viavi Solutions, 2015, P4)

3. Revenue Stream Optimization

Technology monetization is a key concern for Telcos. With the advent of IoT, the demand for small cells has grown exponentially to meet the demands of Smart Connected Homes, Education, and Health & Emergency Services. The proliferation of OTT Apps in the mobile market has led the mobile operators to work beyond capacity & coverage. Mobile TV, video conferencing, live streaming and UGC would encourage customers to pay combined for Wi-Fi & Broadband services. End-user experience intensified with controls like Hotspot 2.0, Next Generation Hotspot & ANDSF. Although with the integration of core mobile network with Wi-Fi network, Telecom companies would still be able to monetize separately by various schemes such as prepaid pass & pay-as-you-go. List the monetization options in subsections.

Places like airports & malls where the no of users is high operators can come in contact with the authorities handling these properties for the purchase of backhaul capacity. Providing indoor small cells have benefited the customers due to the automatic switching between cellular network and Wi-Fi network also optimizing the battery usage by 40% of the user equipment. Customers demand towards personalized experience have led operators to deploy small cells at best sites to blend with the user's context. Presence & Proximity API's are more influential in attracting customers by delivering precise coupons, offers & mobile offers to the customers who are nearby the retail environment. Google glasses & Samsung gear the new Augmented Reality products need micro-location information along with wearer's interest & activity which is provided by small cells.

In comparison with a macro cell, the TCO of small cell is extremely less due to the choice of cells sites & backhaul solutions. Saving from TCO is extremely sensitive due to variations in site rental cost & backhaul. Annualized Capex, maintenance, electricity, site rent & transmission are parameters used to analyze the TCO of small cells.
Corporate offices can be one of the most revenue generated market as 39% - 61% office suffer from poor network coverage. 87% of SME would switch to a provider who would guarantee coverage in their offices. Small cell not only bridge the gap to lack of connectivity & capacity but also reduces the Network TCO, improves the Quality of Customer Experience, increase data traditional revenue & explore areas beyond connectivity. Small cells will have an impact on revenue for Telecom Company as CLV will increase along with improved loyalty and churn. (Huawei, 2014, p 12-20)

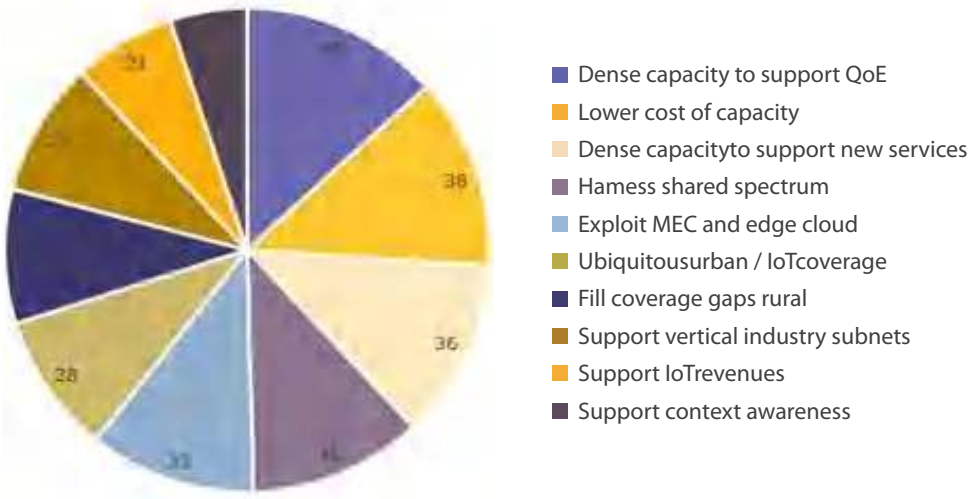

Fig 5. Drivers to Small Cell Deployment. (Small Cell Forum, 2017, P4)

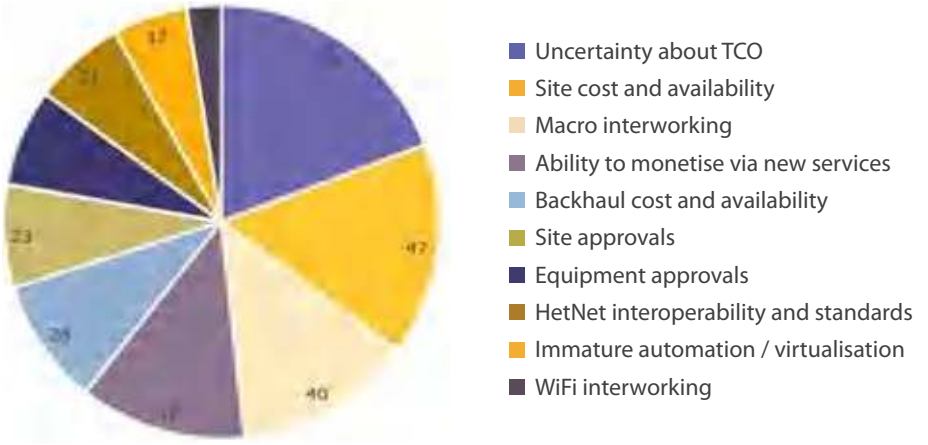

Fig 6. Barriers to Small Cell Deployment. (Small Cell Forum, 2017, P3)

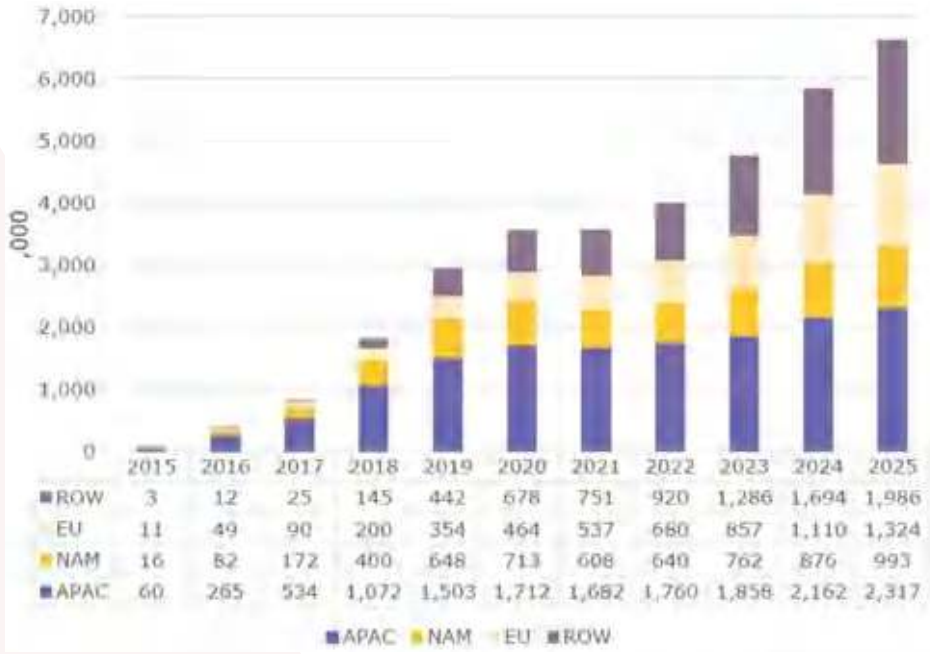

Fig 6. Deployments of non-residential small cells in dense or hyper dense environments. (Small Cell Forum, 2017, P11)

Conclusion

Small cells not only address coverage problems and capacity boost scenarios but also improve user's satisfaction. Optimizing current macro-cell and future heterogeneous networks need a multi-dimensional approach¬¬. It happens with an operator cost efficiently optimizing an existing macro-cell network. With the above discussed technologies this is possible, and hence the future of small cells looks promising. The coming opportunities will favour those operators who will understand how effectively, where and when to deploy these small cells. Operators will gain indirect revenue from this improved satisfaction which will result in customer loyalty. Better service experiences will drive up data traffic usage and increase revenues. Operators can further enrich the user experiences by offering new data base Value Added Services, based on the location and customer presence information; new VAS will increase traffic usage and their revenue will help faster investment return.

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Insinuation of Botnets in Digital Marketing

Rageshree Modi, Omkar Jabade

Abstract

The word Botnet is derived from two words 'robot' and 'network'. These are used by the cybercriminals who generate distinctive viruses that breach the security of several users by taking control of all infected machines into a network of 'bots'. The criminal can remotely manage these networks for mercenary means. Cybercriminals act as a master of large 'bot' or 'zombie' network which seeks to infect tens of thousands or millions of computers. These 'bot' networks are capable of inculcating a Distributed Denial of Service (DDoS) attack, spam campaigns and other types of Cyber Attacks.

Calibration of marketing is science, rather than a superstition. Digital marketing serves as highly redundant expense for many companies. The return on investment on digital ads and customer traffic can be completely unpredictable owing to the high penetration of malware and bots. In digital marketing, these bots are created by fraudsters who generate a large amount of non-human traffic volume for illegal publishers.

This paper explores in detail the insinuation of the botnet in digital marketing and how bots affect the marketing KPI's (Key Performance Indicators). It will also highlight on the detection, tracking and privacy measures deployed by many organizations in their marketing campaign.

Keywords

Botnet, landing page, PPC (Pay Per Click), click fraud, web scraping, DDoS, Marketing campaign, cybercriminals, cybersecurity, website traffic.

Introduction

Digital media forms a massive cluster of activities like Email marketing, PPC Ads, Mobile marketing, SEO, Content Marketing, social media marketing and many more. The wide scope of this particular domain of marketing comes with a completely different set of challenges. The major inclination and sales funnel of Digital Marketing is based on technology and its optimum usage. But with major chunk of work based on online operations Digital Marketing has become a revenue generation stream for fraudsters looking to earn money by fraudulent activities.

Recent coverage of non-human activity and outright ad fraud in digital marketing, the term 'botnet' has become widely popular in digital advertisement ecosystem. The functioning of botnet becomes really easy because of sophistication level and its distinct quality of imitating human activity. These family of bots are programmed to click from one website to another, watch videos and even add items to an online shopping basket (Khanse, 2010).As per estimations by The World Federation of Advertisers, between 10 and 30 per cent of online advertising slots are never seen by consumers because of frauds generated by botnets. (Cookson, 2016).

The objective of this paper is to study about the nature of Botnets and develop an understanding about effects and implication of Botnets in Digital Marketing.

Literature Review

Today, social media sites like Facebook, Twitter, Google and others have transformed the customer's attitude and perception to a granular level and hence revolutionized many businesses. Digital Marketing has established an irreplaceable position by utilizing devices like television, radio and the internet. The concept of Digital Marketing originated from the Internet and search engine rankings of websites. (Khan & Dr.Siddiqui)

Digital marketing makes use of technologies to help marketing activities in order to improve customer knowledge by matching their needs. (Chaffey & Ellis-Chadwick, 2012)

Digital marketing includes online advertising, email marketing, social media, text messaging, affiliate marketing, search engine optimization, pay per click.

Botnets have evolved since their inception. This evolution is now being fuelled by a talent influx generated by the incentive of the monetary gains facilitated by botnet operations. This talent base has allowed new botnet generations to continuously side-step mitigation techniques. This is also due to the fact that computer security has generally reacted to new malware as it is discovered in the wild. This paradigm

has proven to be much too slow for botnet mitigation as the botnet is often well entrenched before any real defence has been implemented. At this point the botnet has already been able to inflict considerable damage. As a result botnet research is shifting to a forward-looking or proactive approach.

Botnet Ecosystem

Botnet ecosystem comprises of many categories of companies and individuals that facilitate ad-frauds. In many of the cases these groups are buying and selling anonymously from each other. Botnets act as a key link in the cybercrime chain. It doesn't take any real technical skill to understand what role they play: cybercriminals do business with each other via the Internet and visiting the sites which can provide wealth to them.

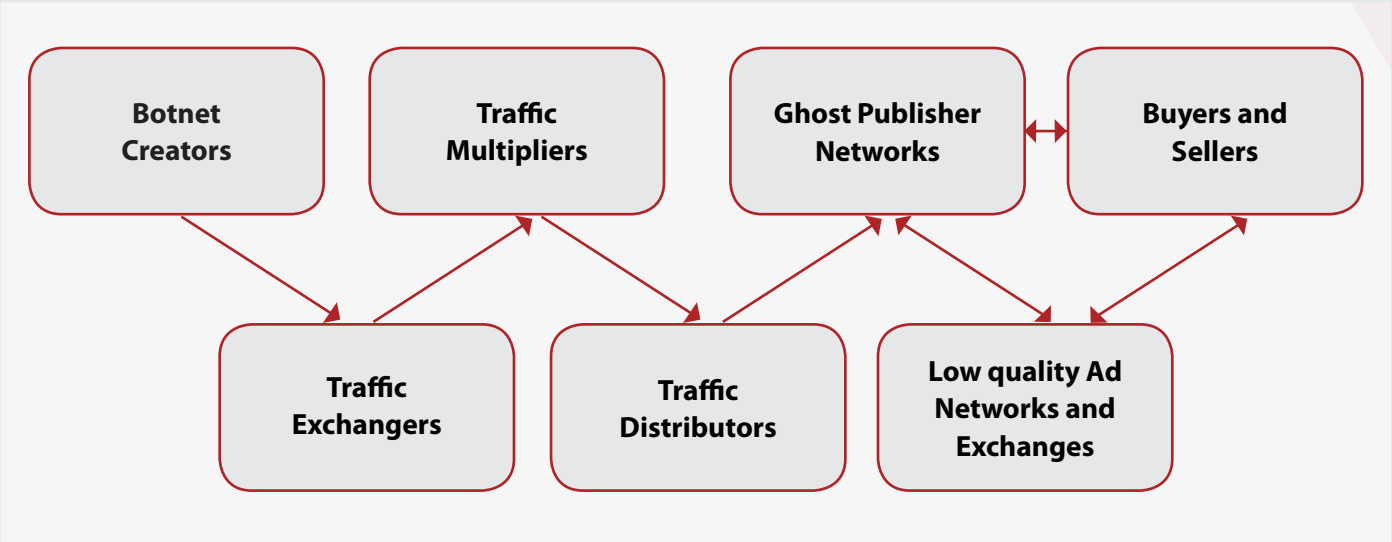

Fig 1. Botnet Ecosystem (Yarnall, Beware Ad Buyers and Sellers: The Drone Army is Coming, 2014a)

Botnet Creators

Botnet Creators: These are developers or programmers who compose malware which are deployed by email and online advertisement battles. This malware disrupts the clients' PCs and lets the botnet take control of the program, without the prior permission of the client. When enough PCs have been tainted, the botnet maker has an "automaton armed force" or "automaton pool" that can be leased to other people who wish to coordinate a vast gathering of web programs to execute assaults.

Traffic Exchanges

These groups collect the Botnet Traffic and sell this to the Botnet Monetizers. Further they sell these drone pools from botnet creators to shady publisher networks or traffic multipliers.

Traffic Multipliers: They purchase Traffic from Traffic exchanges and recruit quasi-legitimate publishers by offering them seemingly harmless proposition, for example they will tell the publishers to launch the false code on the sites and the multipliers will pay according to how many users visited the website.

Traffic Distributors

These Distributors have agreed to run the codes and ad tags from traffic multipliers. These publishers or distributors are getting paid for each user who comes to their site and are generating multiple page-under window on their site. These publishers are essentially used to launder Botnet traffic before they are transferred to ghost publisher sites.

Ghost publisher Networks

They are designed to fool humans, as the sites of the ghost publisher are lookalike of the original sites. Ghost publishers include thousands of sites, making it impossible to screen and scrutinize by manual efforts.

Low Quality Ad Networks and exchanges

Some agencies tie-up with agencies and advertisers by promising campaign performance at low prices. Once

this happens, revenue will be generated in the botnet ecosystem. The low Quality Ad-networks funnel ads to ghost publishers' sites and claim the traffic is real. (Yarnall, Beware Ad Buyers and Sellers: The Drone Army is Coming, 2014b)

Botnet Functionality

The creation and functioning of a Botnet depends on a malware which is injected by a Botnet Master in the devices. The injections of such malware can take place in many ways like email campaigns, pirated software, infected USB drives and infected websites.

Elements

1. Botmaster: A Botmaster is the operator of a Botnet. He creates, controls and spreads the malware to targeted devices by giving commands to the C&C (Command and Control) server or to the individually functioning Bots within the network.

2. Command and Control(C&C) Server: It is a centralized computer that generates commands and sends to the bots in the network. The bots communicate with the C&C server by using Internet Relay Chats (IRC).

3. Bot: The basic element of the Botnet is a Bot. It is the internet connected device like a computer, smart phone, tablet etc. It follows the instructions given by the C&C server and other bots in the network.
(CYBERTHREAT Report -Botnets The Clone Armies of Cybercrime, 2017)

Fig 2: Process flow of distribution of Malware by a Botnet

Uses of Botnets

1.DDOS-A loss of services to users caused by an attack on computer system or network, by consuming the bandwidth of victim network or overloading the computational resources.

2. Spamming: Some bots give a SOCKS v4/v5 proxy (proxy protocol) on a compromised machine .Such bots and botnets have capability to send massive amount of bulk mails and also to harvest email-addresses.

3. Sniffing traffic: Bots can use a packet sniffer and extract sensitive information like usernames and passwords by a compromised machine. Even key information about other botnet can be retrieved from packet sniffer.

4. Manipulating polls: Online polls/games can be easily manipulated by botnets.
(Uses of botnets, 2008)

Use Cases

Botnets have significantly infiltrated the digital advertising space. Following are some use cases of Botnets in Digital Marketing.

1. Methbot

Methbot is a Russia-based botnet having data centers in Netherlands and the US.it provides large volumes of low-cost video advertising impressions by targeting premium video advertising space. A Methbot operation runs on army of automated web browsers run by fraud IP addresses, which watches around 300 million video ads per day on false websites appearing as premium publisher inventory. Its success lies in its high end algorithms which could work against anti-fraud technologies and mimic human user. It also became the first botnet to use data centers to impersonate residential internet connections. (The Methbot Operation , 2016)

2. Chameleon Botnet

This particular botnet emulated human visitors on curated websites causing billions of display ad impressions to be served to the botnet. The host was a US residential machine with Microsoft windows as operating system. The botnet affected advertisers at a cost of over $6 million per month. It is identified as the first botnet to impact the display advertisers.

(Discovered: Botnet Costing Display Advertisers over Six Million Dollars per Month, 2013).

3. SIREN Botnet

SIREN Botnet is a social bot functioning on Twitter. SIREN Botnet created a network of artificially generated Twitter account which has a payload URL, redirecting to a variety of spam pornography websites. Either the accounts directed by quoting a tweet or by displaying payload on their profile bio or pinned tweet. (Inside the Massive SIREN Social Network Spam Botnet, 2017)

Findings

- The third yearly Bot Baseline Report uncovers that the monetary misfortunes because of bot extortion are assessed to reach $6.5 billion internationally in 2017. There is a decrease of 10% compared to previous year. The decrease is happening when computerized publicizing spending is relied upon to increment by 10 percent or more. (Bot Baseline 2016–2017 | Fraud in Digital Advertising, 2017)
- As per Kaspersky Labs report, the share of Linux botnets reached to 71.19% of all attacks In Q4 2017. (Khalimonenko, Kupreev, & Ilganaev, DDoS attacks in Q4 2017, 2018)
- The major frauds are observed for paid traffic acquisition which is redirecting traffic to reach larger audience. The observations suggest that 3.6 times as much fraud comes from sourced than non-sourced traffic. (Bot Baseline 2016–2017 | Fraud in Digital Advertising, 2017)
- The 2016 report suggests that fraud losses amounted to 11% of display spending and 23% of video spending. (Bot Baseline 2016–2017 | Fraud in Digital Advertising, 2017)
- Methbot generates $3 to $5 million in fraudulent revenue every day by click fraud operations. (The Methbot Operation , 2016)
- Botnets are capable to allegedly generate more than $6 million a month by fraud clicks on online advertisements and pay-per-click advertisements.
- As per a Kaspersky Report, DDoS based botnet attacks were registered in 79 countries in Q1 2018. (Khalimonenko, Kupreev, & Badovskaya, DDoS attacks in Q1 2018, 2018)
- Windows-based DDoS bots outperformed the popular new IoT bots, representing 59.81% of all assaults. This is the consequence of developing action by bots having a place with the Yoyo, Drive and Nitol families, which were all created for Windows

Implications

- The presence of botnets in digital marketing campaigns can give skewed website analytics and distorted lead attribution reports.
- The data generated from analytics which helps to drive the next promotional campaign can lead to investments in wrong channels.
- Botnets can lead to wrong landing page optimization decisions.
- Botnets can drive up the PPC costs for companies.

Conclusion

The present cybercriminals can utilize botnets to get unapproved access to a huge number of PCs. Botnets impact quantity of cybercrimes carried out and have brought about a tremendous increment in charge card robbery. DDoS assaults have turned into a regular reality and can be directed by anybody with the assistance of a botnet.

Botnets are the backbone of cybercrimes, guaranteeing a persistent stream of assets amongst cybercriminals, and the proceeded with the advancement of cybercrime. The fate of the Internet, as it were, relies upon precisely how botnets develop later on.

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