ISSN Application No. 21767

Global Journal of Mobile Application and Development

Volume No. 9

Issue No. 1

January - April 2024

ENRICHED PUBLICATIONS PVT. LTD

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MANISH ABHINAV PLAZA-II, ABOVE FEDERAL BANK,
PLOT NO-5, SECTOR-5, DWARKA, NEW DELHI, INDIA-110075,
PHONE: - + (91)-(11)-47026006

ISSN Application No. 21767

Global Journal of Mobile Application and Development

Aims and Scope

Global Journal of Mobile Application and Development publishes research papers in topics related to mobile application at all levels including, but not limited to basic research leading to development of new theories, techniques and application to industry and society. The journal aims to promote the exchange of information and ideas between all classes of society and applications related to mobile

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Impact Of Mobile Marketing Applications In The Current Indian Scenario

Dr. Parul Deshwal
Assistant Professor, Maharaja Surajmal Institute, Janakpuri, New Delhi

ABSTRACT

In India mobile communications have been the most visible manifestation of the extraordinary digital accomplishments seen in the past decade. In modern information and communication age mobile application is one of the most concerned and rapidly developing areas. Mobile marketing has been considered a new form of marketing and provided new opportunities for companies to do businesses. Marketing activities conducted via mobile devices enable advertisers to directly communicate with potential customers in a fast speed and regardless the geographical location. Mobile advertising has been recently referred as one of the best means to cut through the clutter and interact directly with the consumer. Hence, with the trend toward direct, one-to-one marketing, more attention is being paid to the use of the mobile channel as a means of effectively advertising to consumers. Indian mobile market is one of the fastest growing markets due to the increase in the number of middle-income consumers, and is forecasted to reach millions of users in the next decade. Thus, research on mobile marketing would impact greatly on the way business is done. The current study is an attempt to study consumer responsiveness to mobile marketing, in terms of its impact on purchase decision making. The primary objective is to understand the perception of mobile users towards mobile marketing/advertising and their utility value in terms of impact on the purchase decision. The study also aims to concretize some features enhancing the acceptability/ utility of mobile marketing/advertising and suggests an appropriate strategic initiative for the same.

Keywords—Mobile Marketing, Mobile Application, M-Commerce, Customer Relationship Management.

INTRODUCTION

There's no doubt we're living in an appified world. What does that mean? Apps are not just on our phones- they're on our watches, in our cars and the best websites are actually apps. Apps are the primary way people expect to access information and interact with brands. As apps become a way of life, brands must evolve and mature their mobile marketing strategies and apply new tactics and techniques. App marketing has indeed evolved in recent years. In 2013, marketers focused on user acquisition. In 2014 and 2015 people spending almost 90% of their time on media through apps, the focus was on engagement - and how to use data to improve user interaction. These efforts have paid off; people spent 21 percent more time in apps and app retention is at an all-time high.

MOBILE APPLICATION OVERVIEW

Mobile applications are consist of software/set of program that runs on a mobile device and perform certain tasks for the user. Mobile application is a new and fast developing Segment of the global Information and Communication Technology. Mobile application is easy, user friendly, inexpensive, downloadable and run able in most of the mobile phone including inexpensive and entry level phone. The mobile application has wide uses for its vast functioning area like calling, messaging, browsing, chatting, social network communication, audio, video games etc. In large number of mobile application some are pre-installed in phone and others user can download from internet and install it in mobile phone. This large number of mobile application market served by increasing no of mobile application developer, publishers and providers. From the technical point of view the different mobile applications are run able in different managed platforms like iPhone, BlackBerry, Android, Symbian, windows; also some virtual machine such as Java/J2ME, BREW, Flash Light, Silverlight. According to application area, there are different categories of mobile application.

1. **Communications:** Internet browsing, email IM client, Social Networking
2. **Games:** Puzzle/ Strategy, Cards /Casino, Action/ Adventure
3. **Multimedia:** Graphics /Image viewer, Presentations viewers, Video Players, Audio players
4. **Productivity:** Calendars, Calculators, Diary, Notepad /Memo/Word Processors, Spreadsheets
5. **Travel:** City guide, Currency converter, Translators, GPS/Maps, Itineraries / Schedules, Weather
6. **Utilities:** Profile manager, idle screen/Screen saver, Address book, Task manager, Call manager, File manager

THE APP REVOLUTION – AN OPPORTUNITY FOR INDIA

Origins of the 'app economy' can be traced back to the launch of the iPhone in 2007 followed by the App Store in 2008. Since then, the global market for apps has been growing at unprecedented rates. Analysts estimate app downloads have increased from $ 24.9 billion in 2011 to $ 81.4 billion in 2013. This number is expected to rise up to $ 310 billion by 20169. The App Store was one of the first commercially successful digital distribution platforms because it challenged the monopoly of the 'walled garden' through which mobile operators controlled content. Mobile operators forced users to interface with their network for access to apps and other value added services that were delivered on the operator's network.

Thus operators were the gatekeepers, and content providers paid disproportionate amounts to operators to feature their applications. Competition triggered by technological advancements such as the development of Wi-FI enabled smart phones and the emergence of special online stores allowed bypass of an operators' network. These developments encouraged the shift from a telecom-operator controlled network to Wi-Fi as a means of content delivery. This marked the inflexion point for the app revolution. On its part, Apple permitted any developer from the public domain to design apps for the App Store and offered a flat 70% of the total revenue to developers. By contrast, telecom operators had adopted a 30:70 revenue share model in their favor. In 2011, Vodafone offered higher revenue shares to developers to popularize apps. Content thus became more easily discoverable and the App Store represented a one-stop-shop which interfaced between many developers and buyers. The model of having a single platform to disseminate and facilitate the payment of apps has been so successful that Apple's competitors which include Google, Nokia, Research in Motion and Microsoft launched their own app stores. Other aggregators such as users provide app developers with fresh avenues for monetization. Apple helps in advancing a paradigm in which mobile devices evolved from being simply tools for text and voice communication to pocket personal computers. As users wished to do more with their mobile devices, the supply of apps kept pace with the increasing and diverse demand. There are apps now that help users learn new languages, read, music, navigate cities, share files, read the news, learn recipes, and record important health-related information among many other things. The proliferation of apps across many verticals and functions underlines why this sector is regarded as an 'economy' in itself. It is also indicative of the high degree of competition that exists amongst developers. It also demonstrates the shift in value from handsets to apps, as users place more value on mobile software than hardware. India's rapidly expanding middle class will inevitably make the switch from feature phones to smart phones creating vast opportunities for new entrants. Today, over half of Indian smart phone users access the internet daily through their device and nearly all never leave their homes without it. This shows the growing importance of smart phones to Indian society. Affordability of mobile data is another key factor driving this trend. According to the International Telecommunication Union (ITU) India is one the cheapest countries for a phone plan with data. India also represents an opportunity at the 'Bottom of the Pyramid' users due to the huge potential demand for affordable Smart phones and apps from this segment. Unlike developed markets where the Android/Apple duopoly on the OS level is firmly established due to the high penetration of Apple iPhones and Samsung smart phones, India offers space for other operating systems, particularly those that are designed to operate on lower-end devices (OS platforms such as Symbian still enjoy significant market share in India and the Firefox OS is expected to gain traction).

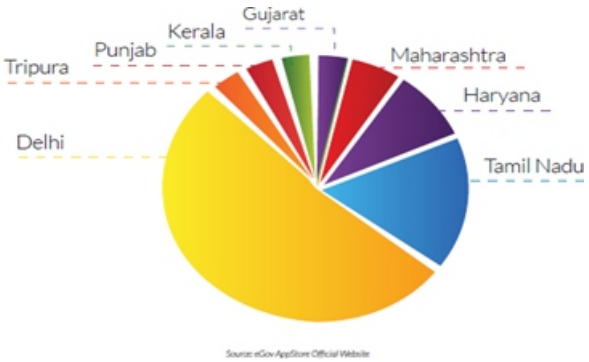


Fig1: Various States of India using Apps

Other platforms such as Android One are also targeted at smart phone first timers, but yet to take off in India. There is a corresponding opportunity for handset manufacturers to design and manufacture devices that can support apps at suitable price-points for this segment. India has been acknowledged as a highly price sensitive market that explains in part the dominance of the Android OS. As stated above, India features among the top five download regions for Google Play by number. However, by revenue it is not among the top ten thereby demonstrating the challenge of monetizing its large base of downloads. Challenge, as the cliché suggests is another course to opportunity that in this case can be exploited by handset manufacturers, OS companies and app developers alike, given the sheer scale of the local Indian market. That data will be the centre piece of India's second telecommunication revolution is a widely held and an eminently justifiable view the promise of the app economy within this paradigm needs therefore to be better understood. For example, how apps will contribute to India's employment, especially of its youth, is an important issue worthy of rigorous investigation. The presence of a large, skilled pool of young software developers coupled with high growth rates in the smart phone and data markets suggests that the Indian app economy has reached the point of inflexion. According to experts familiar with apps, the next break-through innovation in apps will be Indian.

EMERGENCE OF MOBILE MARKETING

After the launch of 3G and 4G digital network, the mobile users started gathering information through their mobiles on internet. Soon the access to social media made mobiles a very handy tool. Due to the progression in the usage of mobile; mobile marketing came into picture. Mobile marketing made reaching customers look like a comparatively easy task. Different operating system like Android, Symbian and IOS supported applications. Mobile marketing used application in their advantage. Mobiles soon started being seen as one of the popular channel for marketing, it was an opportunity which the marketers were ready to encash. Due to the mobile portal many marketers were now able to reach end consumers with much lower costs as compared to the traditional marketing promotion and

could build a relationship with the customer. This relationship was more interactive as marketers could now customize the message, or in other words 'customerization'. They identified customer not only in position of personal identity but also in terms of geographical location, commercial behaviour and social and communication patterns.

- Mobile Penetration: On June 16th 2014, Morgan Stanley reported the average growth rate of Smartphone in India is 25% due to the falling prices, and that the penetration is increasing. It has estimated that by 2018 fiscal, the number will be 519 million. The report also stated that the internet users will rise to 330 million by 2016 financial year driven by higher Smartphone penetration, falling handset costs, faster bandwidth and higher internet content or online services. According to the report the Smart phones in India has witnessed a huge price drop; they have down from $200 to $50 in last two years. As per the Avendus Report, there are over 36 million Smart phones in India11. The report said that over 40% of the Google searches and 9% of the overall webpage view in India comes from mobile devices. Also it said that 30% of India's facebook users are mobile users only.

- Consumer Acceptance and Response to Mobile Marketing: In 21st century customer is the king, every company stands by that. Customers are to be reached by various channels but in today's world mobile marketing communication is the one which reaches more end customers. Marketing of the product is done for creating a positive impression of the brand, for better brand recall, to increase sales and to generate awareness. In today's world customer carry their mobiles everywhere to access anything anytime. Nonetheless, a basic understanding of mobile media and mobile marketing campaign is necessary to develop a successful mobile marketing campaign. Customer in this fast moving life does not have time for something they don't need. A company has to customize and then target their customer. With the help of customer relationship management any company can know about what are customer's preferences and taste. A company need to target them very carefully else it generates a negative impression. Customers generally prefer any promotion which takes prior permission, this way customer can be customerized. The mobile advertising is much more interactive and personal than traditional advertising. In spite of this, the personal and interactive nature of the phenomenon is not present in the conceptualisations or descriptions of mobile advertising. In short- What customers need is:
  - Personalized advertisements according to their needs.
  - Advertisements which they have given permission
  - No spams and inconvenience caused by unnecessary promotion.

LITERATURE REVIEW

There are many definitions of the concepts of wireless marketing or mobile marketing. According to Altuna and Konuk (2009), Plavini and Durgesh (2011), mobile marketing isreferred to as the use of wireless technology to provide an integrated content regarding a product or a service to the intended customers in a direct manner. Carter (2008) defined mobile marketing in a different way, i.e. "the systematic planning, implementing and control of a mix of business activities intended to bring together buyers and sellers for the mutually advantageous exchange or transfer of products" (p. 62). In this case, the key contact point with the intended consumers is their mobile phones. In an article about the implications of mobile technology on mobile commerce (m-commerce), Balasubramanian, Peterson and Jarvenpaa (2002) described that m-commerce is a form of communication which involves "either one-way or interactive, between two or more humans, between a human (or humans) and one or more inanimate objects or between two or more inanimate objects (e.g., between devices)" (p. 350). These authors used the concepts relating time and space to discuss a conceptualized framework of mobile technology and m-commerce. They explained that buying products and services from a brick and mortar retail shop may discourage a customer who does not know the location of the shop and/or who cannot move around easily due to the geographical distance, time constraints, and other barriers. However, it is more flexible and convenient for a customer to get information about a product or a service, and to make a purchase of such product or service via his/her mobile, provided that the seller does provide such mobile applications phone (Balasubramanian et al., 2002; Altuna and Konuk, 2009). Although some marketing activities are not available via mobile technologies, space and time are considered constraints to consumers living in a world without mobile technologies. Apart from reducing the gap caused by time, distance, convenience, costless transportation and interactive channel of communication, customized information is another special feature which makes mobile marketing (m-marketing) emerge as an important and innovative marketing tool (Friedrich et al. 2009). According to a survey conducted Airwide Solutions (a company provided mobile infrastructure and applications services), many advertisers are ready to invest in m-marketing. This survey has been conducted among 50 international brands, and the findings revealed that the number of brands looking to spend a greater proportion of their marketing budget on mobile campaigns in the future has been increased. About 71% of respondents would spend up to 10% of their budget on m-marketing (Thurner, 2008; Altuna and Konuk, 2009). Research has shown that m-marketing can be integrated with traditional marketing instruments to promote products and services of brands, and thus such combination of marketing tools will be able to improve the effectiveness and efficiency of the total marketing plan. Mobile devices have been considered one of the optimal options for communicating marketing information for the following reason. Apart from being cost effective and providing easy access to the target segmentation of

of consumers most of customers carry their mobile phones nearly 24 hours per day (Thurner, 2008; Altuna and Konuk, 2009).

RESEARCH METHODOLOGY

Research Design: Descriptive research Research

Instrument: Structured Questionnaire

Sampling Plan

- Sample Method: Random Sampling.
- Sample Size: 150.

Source of Data

- Primary Data: Structured Questionnaire,
- Secondary Data: Journals, Booklets, & Company Data, etc.

OBJECTIVES OF THE STUDY

1. To study the various reasons of adopting mobile marketing applications by Indians as a tool for shopping.
2. To understand the status of Mobile Marketing in India.
3. To analyze the challenges for mobile marketing in India.

DATA ANALYSIS AND INTERPRETATION

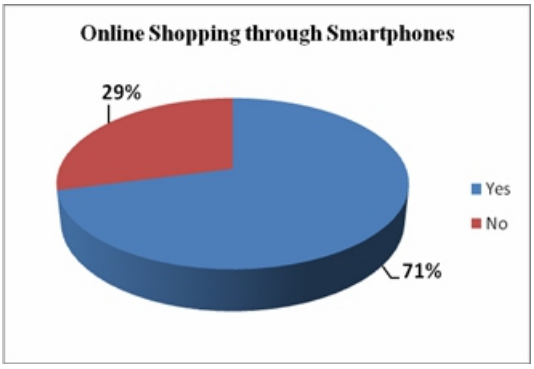
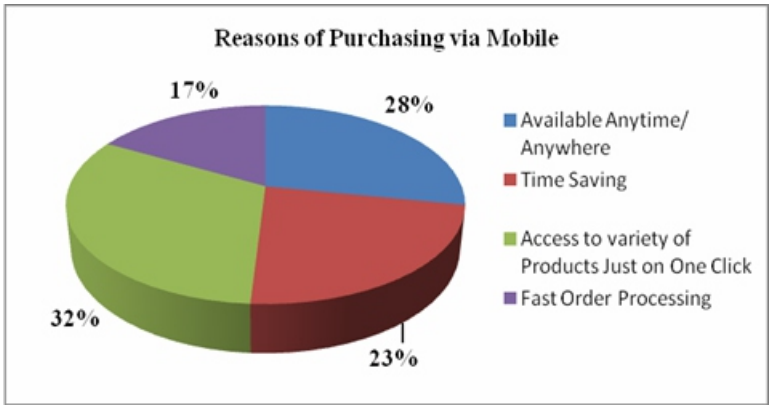


Fig2. Online Shopping through Smartphones

When we analyzed data then we find that 71% respondents prefer to shop via mobile. When we asked why then they said that for its portability it becomes much easier to carry it all the time with them and we can shop via it anytime and anywhere they want. For them mobile make it much easier to shop online. It breaks all the time and approach related boundaries for both the retailer and customer. This makes it quite attractive for customers but 29% go for traditional shopping.

Fig 3. Preference for Online Shopping

People in India shop via mobile because they find it quite convenient and easy. It facilitates them to access to a verity of products just a click away. According to the analysis 37% youths use mobile apps to shop online. Although the percentage is not that much higher but youths are adopting this latest mode of transactions, 49% are looking forward to get more trust worthy services from the online retailers which can make their shopping experience more happy and convenient and 14% do not shop online they go for traditional shopping.



The above study shows that 32% feel access to variety of products just on one click is the biggest reason of purchasing via mobile, 28% says its available anytime/anywhere, 23% says its time saving and 17% use it because of fast order processing.

Fig4. Reasons of Purchasing via Mobile

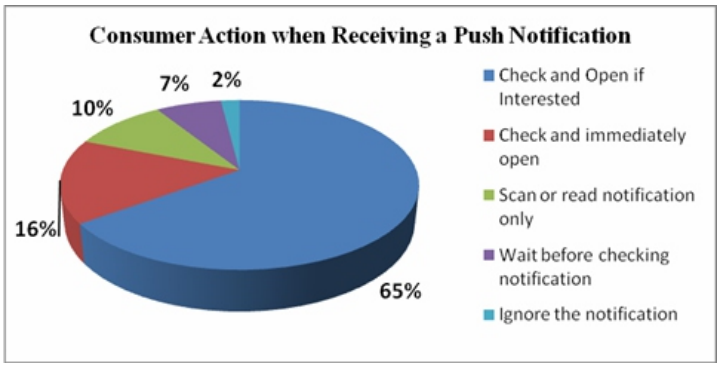


Fig5. Consumer Action when Receiving a Push Notification

When the consumer receive a push notification then 65% will check and open it if they are interested, 16% just chek and open it immediately, 10% scan or read notifications, 7% wait before checking the notification and rest of the 2% just ignore the notification.

CHALLENGES FOR MOBILE MARKETING IN INDIA

Mobile marketing being in a very nascent but growing stage in India faces some serious challenges. There are some impediments that hinder the mass access to content on mobile phones in India. These comprise of dearth of knowledge about the media with marketers, browser setbacks that lead to poor content quality and heavy data charges for accessing internet on mobile. It is important to address the below listed issues before adopting this medium for marketing strategies.

1. **Knowledge about the media:** Although mobile marketing has gained a lot of attention, but its true potential is still unknown to many people. There is still very little knowledge available with the consumers as well as marketers with respect to mobile as media. Awareness does not necessarily pertain to using the medium, but also how to tackle it and handle it. It is evident that today's marketers in India have still not been able to appreciate the power and attention mobile deserves as a medium.

2. **Regulations for marketers:** Consumer's rights protection is one of the crucial way in which today's business houses can retain the trust and loyalty of subscribers, hence it calls for regulations as well. Spam messages have invaded mobile phones as well today afterhijacking the internet. Today what we lack is a set of guidelines and regulations specifically for marketers. This can pose serious threat to customer retention and will end up jamming the inboxes of users with irrelevant content. MMA has braced up to tackle this task before it assumes an indestructible form.

3. **Consistency issues of execution:** The mobile has simplified the identification of target audience for certain products or services. Still businesses face hassles to launch any marketing campaign over mobile networks. Several companies still fail to locate and identify their customers. They are dicey even about which tool to be utilized for marketing- MMS or SMS. It is difficult to design a standard campaign since the diversity in handsets is huge in India. Identifying the user and other details such as user session, browser or device would be a herculean task for marketers and is a matter of grave concern. Similarly, timing of the marketing message delivery is an issue the industry and marketers at large are grappling with today. Information about customer preferences, handsets, geographies, etc, should be analyzed before mobile media strategies are formulated or campaigns are deployed.

4. **Measurement and conversion rates:** The response rates produced by the mobile media have been very promising. But the conversion rate has been quite low. Using the medium through customized targeting is the need of the hour (www.canvasm.com, 2010).

5. **Marketing data issues:** Companies from various sectors are still clueless as to what and how to do it with mobile as a marketing medium. Moreover, lack of marketing data on consumer usage pattern and preferences etc adds to reluctance on jumping on the medium for campaigns (www.canvasm.com, 2010).

6. **Exorbitant Internet data charges**: Consumers from almost all the socio economic strata have started accessing internet on their mobile phones. Still, the access charges are very high. This can be a probable reason for delay in implementing mobile marketing strategies (www.canvasm.com, 2010).

CONCLUSION

Mobile marketing is a very important tool for marketing and is playing very important role in today's scenario. It not only help customer to shop through a verity of product within few seconds, from anywhere and anytime but also help the retailers to target their desired customer with extreme ease. Mobile marketing is the latest trend in the market and is extremely powerful too. Through mobile marketing retailers can reach a bulk of desiredcustomer anytime without making much effort. However mobile marketing is not that much famous among Indians but still they are adopting this latest concept and are looking forward for its exploration. It is really a big deal to sell products online in Indian market where customer is in the habit of touching and analyzing the product before making purchase decision. And introducing mobile for online shopping is entirely a different thing. To promote it among students really needs continuous efforts and advancement in technology that can make the shopping experience more easy and interesting for the customer. Today customers are looking forward for the technology that can not only save their time but also can proof trust worthy. According to the mobile apps of the online retailers should be easy going and should insure security of their personal information too. The de-motivating factor for mobile marketing was security of their personal information. This show that however students are adopting mobile marketing for shopping but still they have less trust on the online retailers regarding security of their personal information. In order to generate great revenues retailers should focus on winning the trust of their customers by building strongly safe and secure mobile services so that youths can rely on the and can make purchase without any fear. But the mentality of Indian customer is that they want more in less with good quality too. So the retailers should come with products that can better fit with their pockets and can grab their attention. As already discussed the

Indian economy is increasing enormously and with the increasing economy demand of Indian consumers increasing too. Indians are adopting mobile marketing gradually and are their expectation level is increasing too. In coming years mobile marketing will become the trend of shopping online. Now it becomes need of the hour to raise the standard of mobile services and to meet the expectation level of the consumers and to earn customer loyalty. It is the high time for the fashion retailers to invent new and innovative ways to grab the attention of youths and to generate desired revenues.

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Mobile Applications Are Major Players In The World Of E-Commerce

[1]Gagandeep Kaur, [2]Gagandeep Kaur
[1]M.Tech Student, Department of Computer Engineering, Punjabi University, Patiala
[2]M.Com Student, Department of Commerce, Punjabi University, Patiala

A B S T R A C T

The advance of mobile technologies have turned handheld devices a part of people's daily life, such as in communication and entertainment. E-commerce turned the entire world into a global marketplace. This paper presents an overview of uses of mobile applications in the field of e-commerce. In modern information and communication system, mobile application is one of the most concerned and rapidly developing areas. This paper focuses on the popurality of Android and types of mobile applications. This paper also describes that how individual mobile user and Indian e-commerce companies promote using mobile applications and the popularity of the mobile application.

Keywords—E-commerce, Mobile Technologies, Mobile Applications, Android.

INTRODUCTION

In the modern age of Information and communication system, people are used to computer and computer application. But Mobile Application Development is a new and rapidly growing sector. There is a global positive impact of mobile application [0909]. The growth of mobile phone market has generated a huge demand for various mobile applications. Numerous mobile phone applications are available that simplify various tasks for the users due to which there is an accelerated growth of software/application development for mobile devices.

Mobile application development is the course of action by which application software is designed and developed for hand-held devices like mobile phones, personal digital assistants, etc. Earlier mobile developers faced so many difficulties while writing applications as they had to build better, unique, competing and hybrid applications which would incorporate command tasks like messaging, contact list and calling in a user friendly manner.

From the technical point of view, the different mobile applications are able to run in different managed platforms like iPhone, BlackBerry, Android, Symbian, windows; also some virtual machine such as Java/J2ME, BREW, Flash Light, Silverlight. The launch of Android smartphones in the market brought a great revolution in Mobile Application Development. Android has turned out to be the cheap, flexible yet powerful new OS of the future, not just compared to iOS, but compared to Mac OSX, Linux and Windows as well.

According to application area, there are different categories of mobile applications:

1. **Communications**: Internet browsing, email IM client, Social Networking.
2. **Games**: Puzzle/ Strategy, Cards /Casino, Action/ Adventure.
3. **Multimedia:** Graphics /Image viewer, Presentations viewers, Video Players, Audio players.
4. **Productivity:** Calendars, Calculators, Diary, Notepad /Memo/Word Processors, Spreadsheets.
5. **Travel:** City guide, Currency converter, Translators, GPS/Maps, Itineraries / Schedules , Weather.
6. **Utilities:** Profile manager, Idle screen/Screen saver, Address book, Task manager, Call manager, File manager.

As more people are beginning to use smartphones for their daily online and offline activities, mobile apps are becoming increasingly important to determine consumer involvement. In fact, mobile apps are now becoming central to how people choose to interact with the online world. Statistics have revealed that a huge percentage of people use mobile apps everyday to search for information, stay in touch with friends and colleagues, shop for goods and perform a range of other functions.

WHY ANDROID IS POPULAR?

It's not only E-commerce which is aggressively promoting mobile app but literally everyone is jumping into Android world. The reasons for popularity of Android are the following:

1) Android gives a world-class platform for creating apps and games for android users everywhere, and as well as an open marketplace for distributing to them instantly i.e. Google Playe Store.

2) There are apps for all most any query that may be Health related or education based.

Android is mobile friendly that is obvious, so customers keep it in their phone and every time the lock gets unlock it's there in front of you.

3) Android helps people to keep updated with all offers and sales or etc on their store.

4) Android phones can run many applications; it means anybody can browse, Face book while listened to the song.

5) There are various versions available of android. It gives freedom of development to develop new apps.

6) There are more than 300,000 Apps available for Android in the market. This itself proves that popularity of Android is increasing among the people in the world.

7) Android has encouraged innovation among the developers to innovate new applications from time to time for sustaining in competitive market.

TYPES OF MOBILE APPS:

Mobile Applications are compact software programs that perform a predefined function and are designed to work on handheld devices such as Smart Phones, tablets and feature phones. But all mobile applications are not the same. There are different categories of mobile apps:

1. **Native App:** Native apps live on the device and are accessed through icons on the device home screen. These are installed through an application store (such as Google Play orApple's App Store). Example include Reminders, facebook app, Twitter app, Gaming applications, etc.
2. **Web App:** Web apps are not real applications; they are really websites. These are stored on a remote server and delivered over the internet through a browser interface. Examples are popular social networks, online mobile games, email and chatting applications, etc.
3. **Hybrid App:** It combines elements of both native and web applications. Hybrid apps are often mentioned in the context of mobile computing.

WHY ARE INDIAN E-COMMERCE COMPANIES PROMOTING THEIR MOBILE DEVICES APPS SO AGGRESSIVELY?

Promoting the product is the target of every company. In India, number of user using mobile technology is much higher than number of users using proper computer or desktop. So more number of people will use the product, more will be customers, which leads to more number in terms of profit. People nowadays spend more time with their mobile. It is much quicker than using a web as it is always in hand. And of course, to capture the necessary data

Mobile apps for ecommerce, also known as m-commerce apps, are powerful applications that are used by different online stores for providing their consumers with a more engaging shopping experience. These apps perform all the functions that are commonly attributed to a particular ecommerce store, such as display of products, handling online payments, confirming deliveries, etc. Having a well designed and functional app is crucial for business nowadays and ecommerce companies in India have significantly benefitted from investing in the development of iOS Apps and Android apps for ecommerce.

Particularly in India, most of the e-commerce websites e.g. Flipkart, Snapdeal, PayTM, Freecharge, OLX, Quickr have suddenly shifted their promotions to mobile apps (instead of general product marketing as earlier). They even offer discounts for mobile app users which are not applicable to desktop site users. Here are some of the ways in which m-commerce apps can help online stores to grow further:

1. Greater brand building scope

Mobile apps for ecommerce offer online stores to establish their brands in a more comprehensive way as consumers once starting to use an app will not remove it from his/her mobile unless something has gone majorly wrong. This allows ecommerce stores toreach to their consumers directly and promote their business and products in a more intimate and effective manner. These apps can let consumers know all the latest updates of the shop and information about new products as and when they occur.

2. Cost effectiveness

Ecommerce apps allow businesses to promote their enterprise more effectively at far lesser costs. Moreover, apps are easier to build up and maintain than websites, and frequently offer far reaching results. The enhanced sales opportunities that come with apps also make it possible for companies to enjoy quicker stock clearance which in turn reduces the overall maintenance or stocking costs.

3. Helps to bring in new customers

Once a mobile ecommerce app is developed, it will always be available in the app store for the consumers to download and use. This will provide an online store with opportunities to develop new customer base at all times.

4. Enhanced sales opportunities

As mobile ecommerce apps come with efficient designs and easy functionalities, they provide users with a quality shopping experience. This in turn automatically increases the overall number of sales within a given period.

5. Having an edge over competitors

With a good app to support online store business, companies can expect to beat competition in a major way. A mobile ecommerce app can serve as an extremely potent tool to reach out to consumers and enhance business when used in a strategic manner. By always being there within a smartphone, it allows an ecommerce store to promote itself without being too loud.

WHY SOME APPS ARE FREE?

Some apps are distributed for free through app stores; the developers make money in a few ways:

- Some sell advertising space within the app. The app developers can earn money from the ads, so they distribute the app for free to reach as many users as possible.
- Some apps offer their basic versions for free. Their developers hope you'll like the app enough to upgrade to a paid version with more features.
- Some apps allow people to buy more features within the app itself. Usually, they are billed for these in-app purchases through the app store. Many devices have settings that allow them to block in-app purchases.
- Some apps are offered free to interest the consumers in a company's other products. These apps are a form of advertising.

IMPORTANCE OF MOBILE APPS

Mobile devices today are unchallengable in the daily lives of millions of people around the world. Mobile apps are providing solutions for businesses, healthcare, and education. Almost every aspect of a human life problem has a Mobile app. Ecommerce stores such as Flipkart, Amazon, Snapdeal and Jabong all have their very own mobile apps to engage customers in a more strong way than ever.

Fig: Smart Phone showing various Mobile Apps

- **Education**

Fig: Smart Phone showing various Mobile AppsThe mobile, cellphone or smartphone is not just used for WhatsApp, Facebook or Angry Birds, it can be used in a multitude of ways from an educational perspective. Fulfilment of educational purposes is a major benefit of smartphones. Apps can help to achieve better performance in organizing, managing, and monitoring classroom activities.

Google Drive can even help teachers in sharing assignments, syllabuses, and reading materials through few taps and clicks. Using mobile apps for learning and teaching reduces paper usage and it is cost effective too. ITunes U is a useful app from Apple for teachers to create and add courses including essential components such as books, lectures, assignmentsand quizzes.

Following are ways how smart phone apps are helpful for the students:

- Look-up information on Internet.
- Take notes and share lectures.
- Work on projects with classmates.
- Access online textbooks.
- Take videos of class presentations or experiments.
- Receive reminders and alerts.
- Communicate with teachers.
- Learn about school activities.
- Share relative links of videos, websites, etc. for a unit of study.

- **Daily Life**

Technology is getting really advanced today and it is becoming an essential part of life. The smart phones are more likely to be the hand held computers for configuring the daily schedules, saving large documents, for watching videos, listening music, using internet, using world wide web, video conferencing and much more than a human mind can think. Today smart phones are the devices which provide all the facilities through various apps what a user need in his daily life, such as e-mail, notebook, Bluetooth, gaming panel, high resolution camera applications, Microsoft office suite, television and many other computerized applications.

In our daily life, smartphones are used for chatting, socialising, entertaining, informing, navigating, and many other activities. Many of the large virus protection companies such as McAfee have also released apps, and this particular Android one allows you to remotely lock and wipe data from your phone.

- **Business**

Mobile apps give businesses the opportunity to interact with customers in real time with valuable information on location and other demographics through user profiles. Business clients can send push notifications to the user promoting new features or information about special offers and discounts.

For companies apps are another way to reach out customers, just like a website or an advertisement. An app can make people their business stand out, which will help them build relationships with customers. Aside from promoting your brand, an app can also help you feature products and services. These app marketplaces have made easier for people to get any relevant information at their fingertips and stay connected to their work on-demand. Therefore mobile applications are increasingly playing a vital role in business with a larger customer-base as well as workforce relying on the convenience of access on-demand to information & solutions. Banks & Financial Institutions, Hotels & Restaurants, Ticketing Sites, Travel & Holiday Aggregators, etc. have found mobile apps to be a great way to increase visibility & sales for their respective businesses.

- **Shopping**

Ecommerce has become so popular and profitable nowadays because buyers have discovered a number of online shopping benefits since the beginning of the electronic commerce era. There are many advantages of online shopping; this is the reason why online stores are a growing business today. Online shopping includes buying clothes, gadgets, shoes, appliances, or even daily groceries. All goods are not available in the same shop so people are required to visit different shops to purchase different goods. Instead of moving one place to another they can purchase all the required goods sitting in their home by using a mobile app. Mobile apps help people to make a shopping at any time, any place, anywhere. In every smart phone, there are various mobile apps for online shopping purpose. There are various top motivators for shopping online which include cash back guarantee, cash on delivery, fast delivery, substantial Discounts, etc.

CONCLUSION

Mobile devices have now become the focal point in IT business. Technology is advancing day by day and people are more inclined towards smart phones, tablets or any other mobile devices. There are 85% smartphone in India out of total mobile phones. Study shows that mobiles are more preferred for ecommerce than traditional tools. Apps are becoming an emotionally important and integral part of people's daily lives. People are trying to use mobile device and mobile application instead of desktop

sites for easy tasks. For many reasons, people want up-graded version of apps. New versions create interests among people; they experiment with it and express their reviews through internet. It is also a very productive way for an enterprise to create a relationship with their customers. In this paper, we have explained so many things about mobile applications and we expect this paper willhelp other for further study in the era of mobile application.

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Design Of Test Selection And Prioritization System For Mobile Application Environment

[1]Rakesh Gupta, [2]Dr. Rajnish Talwar, [3]Dr. Bharat Bhushan
[1]Research Scholar, I.K.G.P. T. U. Kapurthala
[2]Principal (CGC-Technical Campus), Jhanjheri(Punjab) INDIA
[3]Assoc. Prof. & Head, Deptt. Of Comp. Sc. & Application, Guru Nanak Khalsa College, Yamuna Nagar (Hry.)

ABSTRACT

The developing significance and stringent quality requirements of the systems of software are expanding interest for effective software testing. Contracting more test engineers or stretching the time of testing is not suitable solutions which are long-term; rather there is a requirement to diminish the required amount of resources. One alluring solution to this type of an issue is test automation i.e., distributing certain tasks of testing to computers. There are incalculable approaches for handling automation of test, and they operate contrastingly in distinctive settings. Creation and designing of test case is very important phase in product. When there is a team hired for working of the development of a safety critical system which involves life risk or health related risks for the customer designing a complete optimized set of test cases in lesser timeframe using existing test case and library of test case is always tough and if completed successfully, can help in achieving the target of Cost, Time and effort reduction in any software project lifecycle.

Keywords—Test Cases, Test Plan, Software, MES

I. INTRODUCTION

As systems of software turn out to be more and more complex, they are inclined to have increasing number of defects. The expanded complexity of system challenges testers and developers to keep up quality control over the rising artifacts of software and the process of development with test plans which are efficient and effective. While exhaustive software testing can guarantee the deployment of software which is of high quality, exhaustive testing is never practical because of the critical costs of running numerous test cases. Interestingly, if the testing of the software is done nor properly, then failures during the genuine deployment of the software can prompt critical costs included in software fixing, liabilities which are legal and potential and loss of goodwill. What is required is an ideal level of testing that adjusts the dangers if failures with the expenses caused while testing of software is done to full fill reliability requirements of software. [1]

Software Testing is a discriminating component of software quality assurance and speaks to a definite survey of specification, design and generation of code. The expanding perceive ability of software as an element of system and the orderly “costs” connected with failure of software and spurring strengths for all around arranged, thorough testing. The general way for testing is represented by the test plan. The main part of the effort of test planning is centred on making the cases of test. A test case is a portrayal of particular collaboration that a tester will have, keeping in mind the end goal for testing a solitary conduct of the software. Black box testing spotlights on the software's functional requirements. That is, black box testing empowers the software engineer to determine sets of contributing conditions that will completely practice all functional prerequisites for a system. There is a method of black box testing known as equivalence partitioning which partitions the program's input domain into data classes from which derivation of test cases can be done. A perfect test case having no assistance reveals error classes that may some way or another oblige numerous cases which are to be executed before there is an observation of general error.[2]

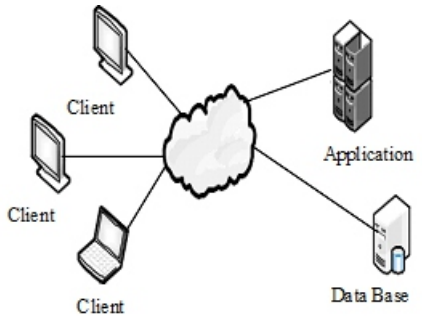

Fig. 1 The system deployment diagram [4]

Generating, gathering, examining and devouring test data are critical to corporate business intelligence. Dealing with the making of test plans, automation of test, test data and usage of exceptionally costly resources turns into a process and discipline it could call its own. Automation of these abilities is a key segment of the today procedure of testing. These testsare frequently complex to do manually and dreadfully draw out to be executed in an environment of manufacturing. This database framework and tools for test wrapped around this procedure is alluded to as framework for automation of test. This framework is the way for improving the efficiency of complete group and provides organizations a competitive benefit by permitting them to deliberately characterize test plans and afterwards rapidly move through the procedure of automating the test plan and creating data of product which is critical. The industry of Automatic test Equipment (ATE) has pushed to build a framework which would hold the sharing of information of test, results and data crosswise over the different platforms of enterprise. Generally, the test engineer adds to a test plan and characterizes the equipment and requirements of

software. In view of the test plan, the equipment of test is assembled and group of testing organizes the automation and hence gathers, examines and reports the information when completion of test is done. The process of test for any given organization can incorporate the accompanying stages: (1) Development of test plan, (2) Selection of interface and equipment, (3) Creation of automation plan and development of automation software, (4) Collection of data and its storage, (5) Analysis of data, (6) Assembly of data sheet/test report and also its publication,

(7) Test monitoring of supply chain – manufacturing of contract, (8) Utilization of test station, scheduling and reservation, (9) Tracking and calibration of test asset, (10) Manufacturing Execution System (MES). [3]

II. TEST CASES

A test case is a portrayal of a particular interaction that will be held by tester, keeping in mind the end goal to test a solitary conduct of the software. There is genuine information in the test case that ought to be entered into the software and the expected result that must be generated by the software. A particular test case consists of these sections, generally laid out in a table [4]:

1. A unique number and name.
2. A prerequisite that this test case is working out.
3. Preconditions that depict the condition of the software prior to the test case.
3. Steps that depict the particular steps that makes up the association.
4. Expected results that portray the normal state of the software after execution of test case is done.

Designing Test Cases: Functional system and acceptance tests are composed by test engineers by utilizing requirements of system and techniques of formal test design such as analysis of boundary value and equivalence partitioning. There come some difficulty in designing good test cases and it is one of the primary skills which must be possessed by expert test engineer. There are likewise approaches for automating the process of test design. Expected results for tests can once in a while be produced consequently utilizing which are known as oracles, external trusted entities which can be questioned for expected results. Yet an oracle is some current framework, they can likewise be made only for purposes of testing. The tools can likewise create cases of test which are dependent upon code or interfaces of software. In testing which is model based, the modelling of system is done in such a subtle element that the derivation of test cases can be done automatically form the model. [5]

III. RELATED WORK

This section reviews the existing work on the testing of software and test cases in mobile environment. In Paper [6], the importance of keeping high level of abstraction within automated test and its characterization is discussed. In order to keep an automated test suit running even though an extensive development process is in progress is a crucial task for efficient software development. It talks about how this abstraction should be constructed and used. The abstraction designs the same for both input and output. Also, when talking about abstraction, the main design of the test suits is important. The other tests, that do not concern the added attribute will run and pass. That is, if tests are constructed in such a way that every single test focus on just validating the output relevant for this test, and not all tests validate all the output every time, then the abstraction would increase and the maintainability effort would be lower.

In Reference [7], authors discussed about the connected portable applications development. It is a complex task due to device diversity. Therefore, the approaches which are independent of device are aimed at concealing the differences among the distinct mobile devices in the market. This work introduces DIMAG, a framework for software for generation of mobile applications which are connected for platforms of multiple software, following a declarative approach. DIMAG provides transparent data and state synchronization between the server and the client side applications. The proposed platform has been designed making use of existing standards, extending them when a required functionality is not provided.

Reference[8] explained an approach for mobile applications which are heterogeneous. To adapt to failures and changes which are unpredictable, additionally with the different settings offered by the plenty of accessible devices, mobile applications should be as versatile as could be expected under the circumstances. On the other hand, mainstream strategies of adaptation are normally characterized significantly and oblige complex control procedures emphatically interlaced with the logic of application, respecting applications that are not easy to build, keep up, and evolve. This issue is solved by proposing an approach which is declarative to deal with adaptive mobile applications which are also heterogeneous. The benefits of this strategy are demonstrated through an example roused by a mobile application which is currently distributed worldwide, whereas the implementation of the proposed methodology has been accepted through an arrangement of experiments and simulations aimed at representing its performance.

In Paper[9], authors talked about mobile software applications. The abundance of mobile software

applications (apps) has created a security challenge. These apps are widely available across all platforms for little to no cost and are often created by small companies and less-experienced programmers. The lack of development standards and best practices exposes the mobile device to potential attacks. This article explores not only the practices that should be adopted by developers of all apps, but also those practices the enterprise user should demand of any app that resides on a mobile device that is employed for both business and private uses.

In Reference[10], authors presented a mobile application which is context appropriate for sustainable weight loss. A mobile application is designed win this work that influences three methodologies from theories of change of behaviour which are also proven (expanding awareness of the points of dieting, cultivation self-efficacy and inspiration, and affecting attitudes of dieters). We adjust the application to the nearby context of the society of a middle easterners by leading an ease of an experiment of usability testing with potential clients of the application. The principles of localization are applied additionally to infer an application which is appropriate. Beyond the connected usage of the application, the paperadds to at present rare assortment of literature on mobile development which is Arabic based.

IV. MOTIVATION

Method of designing new test cases and choosing existing test cases directly affects profitability, efficiency and effectiveness of any product or system. Specially in the field of safety critical embedded systems and consumer electronics, having a mechanism to create automatically test cases which are new from given parameters and effectively choosing the appropriate test cases and results of test from existing test case library can help in achieving overall product process improvement, Quality and safety achievement and reduction in cost, efforts and times. The main problems which are solved in this research work are as follows:

1. When Independent Verification & Validation tries to optimize testing "How test cases ought to be selected and how test priority should be managed?"
2. Finding an effective design for an automated and intelligent system complete test case management and creation of automated test case which reduces the complexity of managing and creating accurate test data.
3. Effectively providing an interface for this system so that it can be plugged easily with different critical systems and consumer electronics goods.
4. How testing should be focused i.e. which parts of the products should be tested more thoroughly?
5. To optimize testing, the most fundamental question that has to be answered is from the test suite, which of the test cases should be executed?

The major objectives of this research work are given below:

1. To study and compare the existing testing system for mobile application environment.
2. To propose an efficient test selection and prioritization system for mobile application environment.
3. To design appropriate scenarios for testing of proposed systems.
4. To verify and validate proposed approaches using appropriate test.

V. PROPOSED WORK

The approach is based on automated generation/creation of test cases from specific inputs and management of test plan based on existing test cases and plans on similar product line.Proposed system will analyse the key parameters of a test plan, data of test result, test case, etc. This analysed data will be stored in a repository and a user friendly extraction software utility will be proposed which will make new test cases of similar product line in a short manner. Proposed system will also use an intelligent approach to make test cases which are new based upon previous test experience and gray coverage areas.

The main parameters of standard test case are given below:

1. Type of test case
2. Requirement Id
3. Test case type
4. Feature/Function/Category
5. Precondition
6. Inputs
7. Input Criteria
8. Procedures
9. Expected behavior result

In this research work, we have proposed a complete system for advanced test plan creation, management and extraction tool (STP Star) for High End embedded systems and safety critical systems. The proposed solution will cover and extract up to 18 different types of STP and will feature a color touch-screen, Avionics Bus systems, DO-178B compliance, MCDC, mobile application test , Learning, Activity control, Profiles etc.

The thesis enlighten an approach of creating new test plan, generation of test cases from existing test cases can be prepared which will use intelligent approach to generate efficient test sets from existing test plans on the basis of Entry criteria, exit criteria and some other selected parameters. The proposed design and algorithm has been implemented in such a manner that it can be used for:-

1. Creating a set of test cases for similarly existing products/slightly variant.
2. Creation of test cases for embedded products like Safety critical systems, Mobile phone, remote control and multiple consumer electronics goods.
3. This algorithm takes care of changes in the test plan template and automatically configures the test database according to a new format.
4. It can be easily clubbed with a plugin information system to have a complete automation solution for product testing.

The basic software architecture approach for admin and user levels of the test plan creation, extraction and management system are shown in given figures.

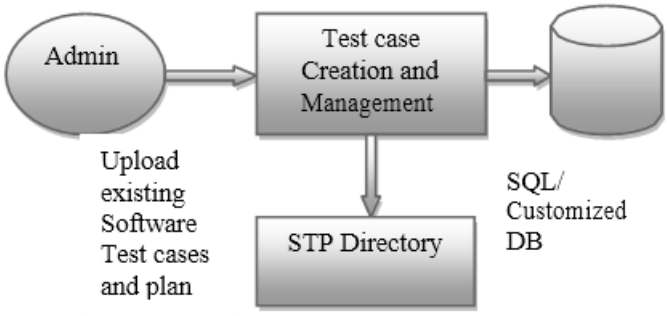

Figure 2

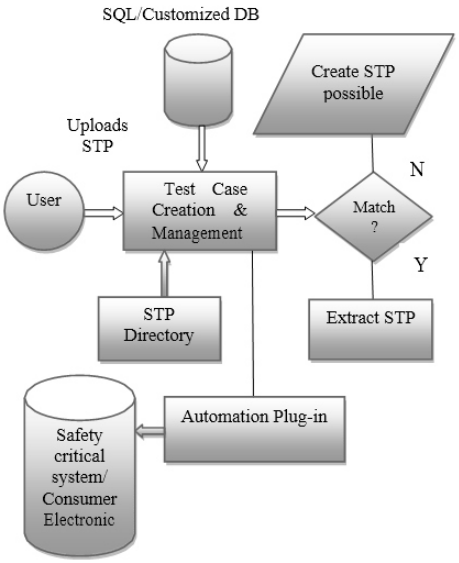

Figure 3

VI. CONCLUSION

In this research work, we will demonstrate that an effective testing system and environment which has the capability for creating new test cases for complex products in an automated manner without introducing manual error and use the existing intelligent test baseintegrated with an automation system can achieve a faster test cycle which is more effective as compared to a generic manual or pure automation cycle. This research work demonstrates that an effective test environment with generation of test case, test automation and test intelligence capability can be used for product development. This will ensure a defect free safety critical or consumer electronics goods as well as a happy customer.

ACKNOWLEDGMENT

The paper has been composed with the kind assistance, guidance and support of my guides who have helped me in this work. I would like to thank all the people whose encouragement and support has made the fulfilment of this work conceivable.

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IoT (Internet Of Things) On Android App – Android Application For Remote Monitoring System

N. Kumaran
Department of Computer Science Engineering,
SCSVMV University, Kanchipuram, Tamilnadu

ABSTRACT

This project provides the idea and method for developing the android app for connecting IoT devices. It's always a difficult task for connecting an embedded device to a mobile device and mainly creating it as an app. So the method which I used is quite easy for implementing this process and will be efficient as well. "To check the working condition of heat pump" – it's the main aim of the project and have to achieve through the android operating system platform. Heat pump is an embedded device which may be present at remote location and mainly in an industry. So to connect the heat pump to the internet the "Thingworx" platformwas used. The main theme of the app is to extract the data from the Thingworx cloud and to show in the android based mobile device.

Keywords— IoT, Thingworx, Heat Pump, JSON, Android, Web service

INTRODUCTION

This project focuses mainly on developing android applications for the IoT (Internet of Things) devices. (IoT is the internetworking of physical devices which is embedded with electronics, software, sensors etc. that enables these objects to collect and exchange data.)In this project, I use Thingworx platform to send and receive data from the Heat Pump. The heat pump contains the sensors from which the data are sent and received through HTTPS in time period.Thingworx is the complete development of IoT platform mainly designed as cloud (Server) to store data from the embedded system which obviously uses sensors for exchanging data. So in my app, I have to get the "thing" (A thing is the collection of properties, service and events.) and show its properties and working in android OS, so the person working in the company will easily check over the machines.

The Heat Pump will be present in the remote location and will be inside a turbine which can't be seen from outside. It has sensors present in it as I mentioned above. The sensors will send the data to the Thingworx server in an encrypted form and HTTPS format. So the data will be stored in those servers

and the data can be processed and analyzed. The datathen made to be displayed in the android platform as a working app. This is the main theme of the project.

RELATED WORK

There are many existing system which use thingworx platform for connecting the embedded devices and which can run as an android app. But most of the software doesn't connect with android mainly industrial equipment which has several process and very tough to execute by using a simple mobile device. The software will be run in the web browser of the company (Service based company). If there are any changes/problem/issues in the working condition of the device, the service will be made from the company like through Phone calls or through e-mail. They'll inform the person working there with the heat pump. The person will be informed and the device will be managed according to the situation.Before using the sensor, the temperature will be checked using thermometer which will have percentage error around 5%. Using the sensor will be quite accurate. It won't have any types of errors.

DRAWBACKS OF THE EXISTING SYSTEM

1. The data will be run in the desktop or in the browser, and the data will be processed or analyzed only by the technician or experienced person.
2. There are many applications to connect the IoT devices but there are no application for connecting industrial equipments with this method as it is highly efficient.

PROPOSED WORK

There are five remote things (Heat Pumps) present in the industry. These five devices have to be connected in the android application. So the connection usually starts from the sensor in the device which sends the data lively. The data which is to be sent from the sensor will be encrypted with HTTPS. The encrypted data will be sent to the thingworx server i.e. sent to the cloud. This data will be raw, so have to extract the required parameters. This process will be done in the web service, converting the parameters (data) into JSON format. The JSON data will be sent to the android device. In the android platform, required parameters will be filtered and the data are shown. JSON is the easier way for getting data from the server to the android application. The main aim is to check the working condition of the device lively and will succeed through this method. The diagram explains the overall architecture of the devices which is connected to the android application.

Fig. Overall Architecture of the Devices Connected to the Android Application

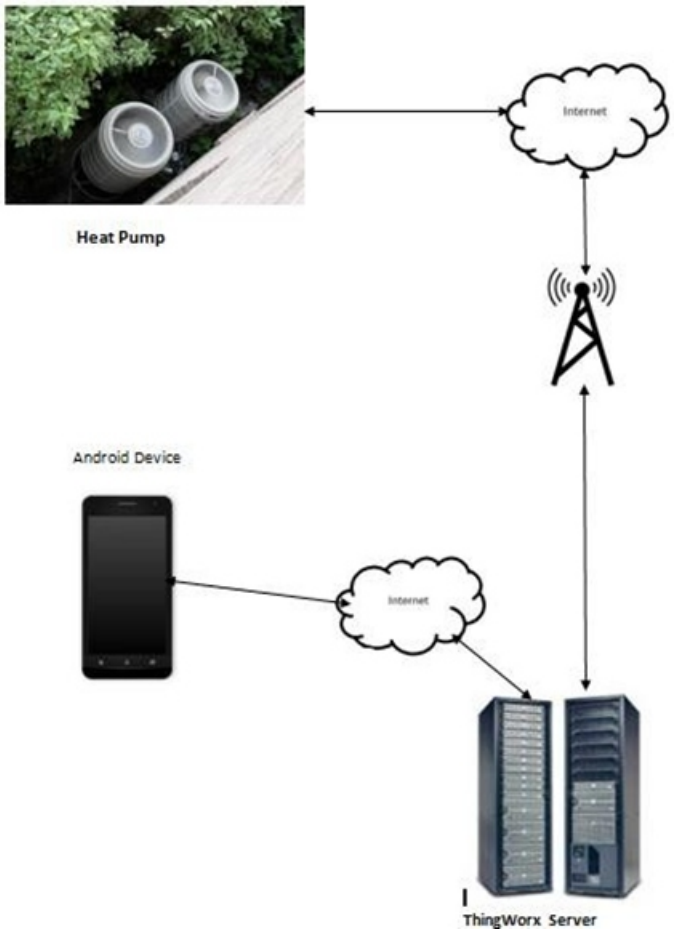


Fig. Overall Architecture Diagram of Heat Pump

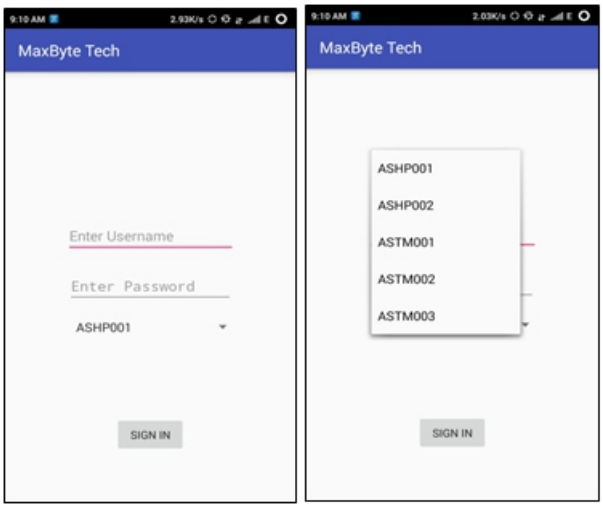
Pseudo Code:

Sensor Activity:

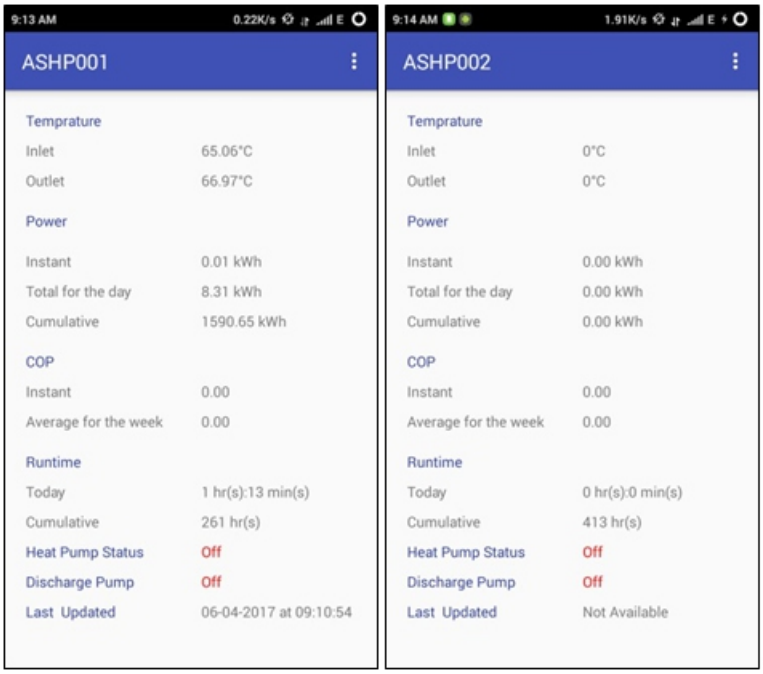
```
public class sensoractivity(){
Private void
setsensorvalue(){e.setText(sensorDetails.get("JSONParameter").toString()+(char)0x00B0+"C
");c.setText(sensorDetails.get("JSONParameter").toString()+(char)0x00B0+"C");
a=String.format("%.2f",Double.valueOf(sensorDetails.get("JSONParameter").toString()));
String n=
String.format("%.2f",Double.valueOf(sensorDetails.get("JSONParameter").toString()));
   String m = String.format("%.2f",
Double.valueOf(sensorDetails.get("JSONParameter").toString()));
txt1.setText(JSONParameter+" kWh");
txt2.setText(JSONParameter+" kWh");
txt3.setText(JSONParameter+" kWh");
@override
Protected void Execute(JSONObject object){
//set sensor details
}}}
```

RESULT

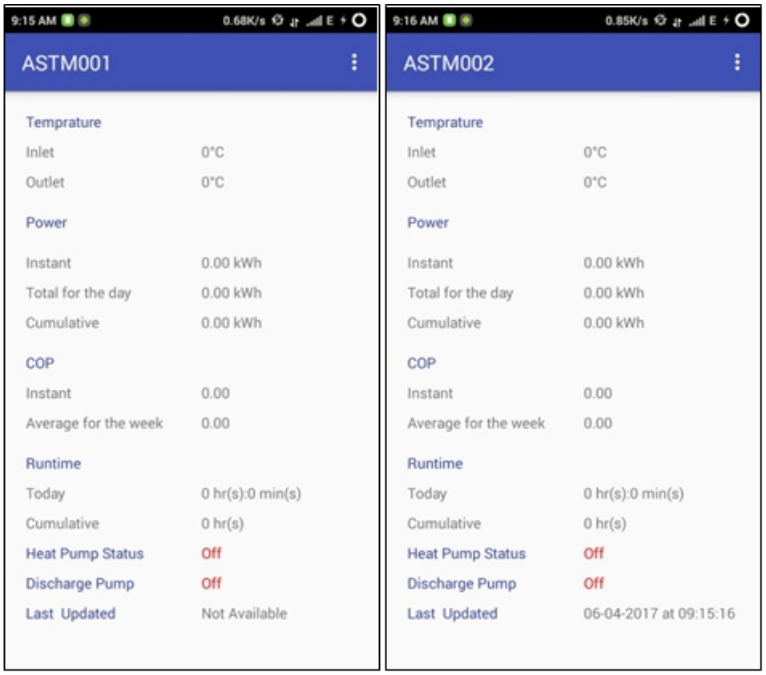
Login Activity: List of Devices:



Device 1-ASHP001 Device-2 ASHP002



Device-3 ASTM001Device-4 ASTM002



Device-3 ASTM003

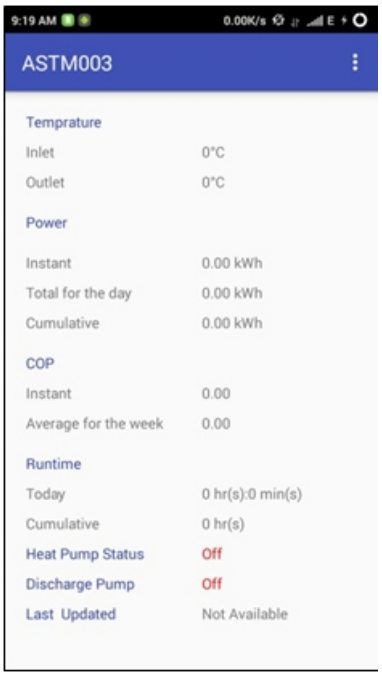


Table 1. Temperature from the Heat Pump Sensor

S. No.	Time (mins)	Temperature (^{0}C)
1	T1	46.5
2	T2	50
3	T3	55
4	T4	59
5	T5	65
6	T6	69
7	T7	74
8	T8	80
9	T9	83
10	T10	84
11	T11	85
12	T12	85.5
13	T13	85
14	T14	84
15	T15	85

To find the average(fx) for the temperature according to the time period.

fx= $\sum(x) / N = 72.67^0$C

$\sum$ represents the summation

X represents the sum of the temperature.

N represents the total number of temperature.

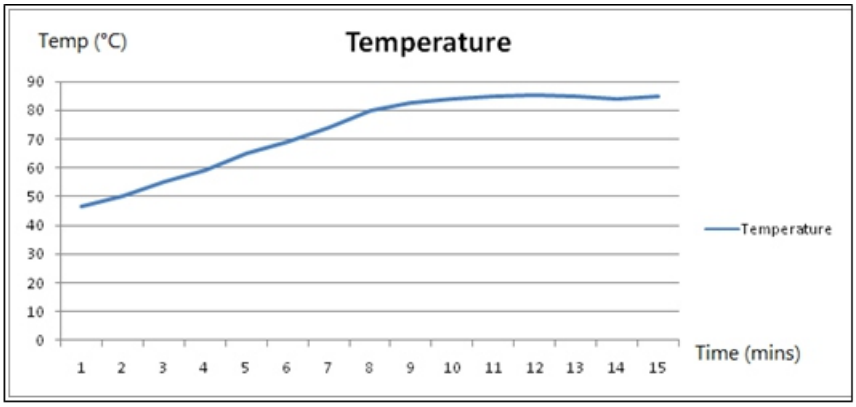


Fig. Graph for the Temperature from the Heat Pump Sensor

CONCLUSION

The app will be used by the person who works in the industry and who does not have the proper knowledge of handling data. So it's easy to view the working condition of the heat pump which is present inside the turbine. So if there is any issue on the device, it can be easily verified by the industrial worker. And it also saves the time of service team as they need not have to track the device condition and inform to the industrial people about the device. The app is just enough for noting the overall working condition of the heat pump. . The heat pump produces temperature around 80 – 85 degree Celsius.

FUTURE WORK

The app can be further developed by increasing the number of process done by the sensor. It can be designed to control the whole device from the app. Like, for example: If we switch- on the heat pump from the app, the heat pump will be switched-on and starts working in the industry and vice versa. So with the addition of parameters in the thingworx, and the process to be added in the sensors, then we can change it in app too. So there is more future scope in the IoT field and mainly to bring the device working on the mobile app. IoT is the trending technologies. And to control from the mobile app, it is totally useful.

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Only Thumbs Down? Samsung Galaxy Note7 Fiasco Twitter Sentiment Analysis Using Hybrid Method

[1]Janvier Nkundukozera, [2]Ellen Mushimiyimana, [3]Roger Nyiringabo, [4]Evariste Mwumvaneza

[1]Key Laboratory of Intelligent Perception and Image Understanding of Ministry of Education, Xidian University, South TaiBai Road, Xi'an, China

[2]Department of Logistics Management, School of Economics and Management, Beijing Jiaotong University, Haidian District Beijing, P. R. China

[3]Department of Computer Technology and Engineering,School of computer and information technology, Beijing Jiaotong University,
Haidian District Beijing,
P. R. China

[4]Department of Mathematics, Sciences and Physical Education, College of Education and Library sciences, University of Rwanda, Rwamagana-Rwanda

ABSTRACT

With the almost ubiquitous access on the web, people use microblogs like Twitter, Facebook and Weibo to express their opinions on a wide variety of topics such as products, services, events, organizations, etc. Sentiment analysis on tweets has become a rapid and effective way of gauging opinion for business marketing or social studies. Unlike large opinionated corpora such as products reviews, tweets have unique characteristics that require special treatment to analyze the sentiment they convey. In this paper, we use the hybrid method combining the lexicon based and machine learning-based methods to perform sentiment analysis on tweets in the aftermath of Samsung Galaxy Note7 fiasco. First, we apply the lexicon-based approach todetermine the semantic orientations of opinions expressed in the tweets. This method gives high precision but low recall. To solve this problem, additional opinionated tweets are identified among tweets previously classified as neutral by handling words that are context dependent. We use Pearson's chi-square test to identify opinion words which are not in the lexicon and use them to train a support vector machines (SVMs) classifier to assign polarities to other additional tweets. This method is effective since it does not involve any manual labeling of tweets and has the ability to automatically adapt to new fashions in language, neologisms,and trends found in tweets. In this paper, we found that even though the Galaxy Note7 was removed from the market and killed completely by Samsung due to its battery catching fire, more customers still rated its feature more positive and labeled it as the top Android phone of its time.

Keywords—Opinion mining, sentiment analysis, context-dependent opinions, lexicon, SVMs, semantic orientation.

1. INTRODUCTION

Twitter is a popular microblogging and social networking website on which a big number of people are willing to post their opinions on a wide variety of topics such as products, services, events, organizations, etc. [1]. Thus, Twitter is currently considered as a rapid and effective way of gauging public opinion for business marketing or social studies. Product managers can gain timely insight into opinions on their products by evaluating people's opinions on Twitter[2]. In this paper, we mine people's opinions following the Samsung Galaxy Note7 fiasco.

The Galaxy Note 7 was a flagship phone of Samsung electronics in 2016 and a deemed better android phone of that time[3]. Since its acclaimed launch, the Note 7's early days were marked by glowing reviews because of its amazing features such as a larger, sharper, and richer display than the top phones of that time, less weight , easier to hold, a big phone that didn't feel big, built-in retina scanner, water resistance, rear-facing dual cameras making its specs impressive, the simplicity of its design, the striking beauty of its curved screen and a 3,500 mAH battery that was able enough to allow it to go without a charge even while being used constantly for 36 hours. Nevertheless, it is thought that it is this powerful lightweight battery which includes lithium-ions that would have been its downfall[4]. The early produced Note7 and its replacements did not only got fire in the homes of some customers, shops,and airplanes but also the company themselves decided to halt its production, call customers to exchange Note7 for other Samsung smartphone or receive a refund and finally killed the brand completely after only 53 days of existence from August 19, 2016, to October 10, 2016[5].

In this paper, we gauge the opinions on tweets in the aftermath of the Galaxy Note7 and its features using a combination of lexicon-based and machine learning-based methods to determine the polarities associated to the Note 7 as a whole and to each of its features.

Sentiment analysis can be performed based on different approaches. One of those approaches is based on a function of opinion words in context. Opinion words are words that bear desirable/positive (e.g., good, amazing, etc.) or undesirable/negative (e.g., bad, poor, etc.,) states[6]. This approach uses a dictionary of opinion words to identify and determine sentiment orientation (positive, negative and neutral) in tweets. The dictionary is referred to as the opinion lexicon and the approach of using opinion words to determine opinion orientations is referred to as the lexicon-based approach to sentiment analysis[7][8]. Though this approach has proven itseffective in the analysis of product reviews and can be applied to tweets as well, some tweets characteristics are detrimental to it. For instance, abbreviations (e.g. lol, omg, etc.), emoticons (e.g. :-))) and colloquial expressions (e.g. be blue, go

go nuts, etc.) etc.which are often used in tweets may convey sentiment orientation but they are not included into the general opinion lexicon.The lexicon-based method would suffer from two problems caused by such forms. First, the lexicon-based method would regard tweets with forms like lol, omg, go nuts, :-) as neutral since these forms are not in a general lexicon. This leads to the law recall problem for the lexicon-based method which depends entirely on the presence of opinion words to determine the semantic orientation of the tweet. It is true that these Twitter expressions can be added to the opinion lexicon but it would almost be in vain since such expressions keep changing and users come up with new ones following the trends and fashions of the internet. Secondly, the polarities of such forms can be domain dependent and this can mislead the lexicon-based method during the calculation of sentiment score. This is the prominent problem associated with the lexicon- based method of sentiment analysis thatrequires a comprehensive lexicon without which the sentiment analysis results will suffer[9].

The alternative to this problem associated withthe lexicon-based method is to apply machine learning-based method to perform sentiment analysis[10]. This is a supervised learning method in which labeled tweets are used to train a classifier that is later used to classify newly acquired tweets into corresponding classes (positive, negative, neutral). However, it is not easy to apply manual labeling in this paper because it would have been labor-intensive and time-consuming to label manually a large set of more than 19500 tweets. To solve all the above-mentioned problems posed by both lexicon-based and machine learning-based methods, a combination of both methods was brought into action and named as the hybrid method. The hybrid method improves both the recall and F-score compared to the lexicon-based method[11][12]. To get the better of the hybrid method, we perform sentiment analysis on tweets as follow. First, we employ a lexicon based-method for tweets sentiment analysis. This methods results in good precision and very low recall. To improve the recall, we apply machine learning-based method on the tweets previously classified as neutral as follows. First, we extract some additional opinionated indicators through the Pearson's chi-square test on the results of the lexicon-based method. Secondly, we train the classifier, support vector machines in our case, to assign sentiment polarities to some of the previously tweets classified as neutral. The hybrid approach is an unsupervised method except for the initial opinion lexicon which is publicly available. The core of the hybrid method of sentiment analysis is the ability to select domain-specific words, emoticons, colloquial expressions, and abbreviations etc. as additional opinion indicators through a statistical test. For example, the positive tweet, “the GalaxyNote7 is so cute. I looooooove it!”Although the expression “looooooove” isnot a general opinion word, if we find itoften co-occurs in positive opinion contexts through a statistical test, we can infer it is a positive opinion indicator. And the SVMs sentiment classifier could learn this important contextual information in training[9].

2. RELATED LITERATURE

This research is in the area of sentiment analysis and to determine whether a tweet expresses a positive or negative sentiment the hybrid method which is a combination of lexicon-based and machine learning-based methods is used.

The lexicon-based approach employs some function of opinion words to determine the polarity or sentiment expressed in the tweet[13][14][7][8]. The drawback of this method is that it results in a low recall.

The machine learning-based approach commonly known as supervised learning trains the sentiment classifier using a bag of words features such unigrams or bigrams[10]. The common learning techniques used for sentiment analysis include classification and regression trees (CART)[15], random forests (RF)[16], naïve Bayes (NB)[17], Maximum entropy (Maxent)[18], [19] and support vector machines (SVMs)[20], [21]. All these techniques and others are based on the training data manually labeled following each application domain as it is well known that a sentiment classifier may perform very well in the domain that it is trained, but performs poorly when it is applied to a different domain[22].

There are some literature works that used both the lexicon-based and machine learning- based methods. Classification of reviews into two classes, positive and negative was studied in[23] but the neutral class was left out. A subjectivity lexicon was used to identify trainingdata for supervised learning for subjectivity classification in[24] but our work is not about subjectivity classification. Unlike the hybrid method that identifies additional opinionated tweets among tweets previously classified as neutral, the above literature works did not deal with the third class (neutral class) of the sentiment analysis, hence, they resulted in the low recall[9].

Our work finds the polarity of a tweet as a whole, hence, falls into the document level sentiment analysis like some other works such [25]–[28].

There are also some works related specifically to the tweets sentiment analysis. A classifier to classify tweets into positive, negative and neutral classes was built in [29]. Author of [30] used specific characteristics and language conventions such as hashtags and smiley of Twitter as classifier training features. There are also various online Twitter sentiment analysis systems, for example, Tweetfeel[31], Twendz[32], Sentiment140 [32], etc. All these approaches are based on the supervised learning but

the hybrid method used in this paper does not need supervision or manually labeled training data.

3. MATERIALS AND METHODS

This section deals with the exploration of data used in this research to get the glimpse of what is hidden in the tweets under our study. It describes sentiment analysis and the Twitter data characteristics briefly. It also presents the application of the hybrid method on the sentiment analysis of tweets in the aftermath of the Galaxy Note 7 fiasco.

Characteristics of Twitter data

Tweets are characterized by the Twitter own language conventions[33]–[35]. The following are the example of Twitter conventions.

1. Fixed length. Unlike usually opinionated corpora such as reviews and blogs which could be long, tweets are limited to 140 characters.
2. Emoticons and colloquial expressions are often used in tweets, e.g. looooove, :-).
3. @username. Shows that a tweet is a reply to a user whose Twitter name is "usename1"
4. "#" known as the hashtag is used to mark, organize or filter tweets depending on given topic or category.
5. "RT" an acronym that is put in front of a tweet to indicate that the user is repeating or reposting a tweet.
6. The huge volume of data. It is estimated that 500 million tweets are posted each day. That is 6000 tweets every second and the number is still increasing rapidly[36].

Sentiment Analysis

Sentiment analysis or opinion mining is the field of study that analyzes people's opinions, sentiments, evaluations, appraisals, attitudes, and emotions towards entities such as products, services, organizations, individuals, issues, events, topics, and their attributes[6][37]. Sentiment analysis mainly studies opinions which express or imply positive or negative sentiments.

The problem of semantic analysis of tweets can be well solved after one has understood properly the structure of an opinion as expressed in tweets.

In general, opinions can be expressed on different things like a product, an individual, an organization, an event, a topic, etc. the term *object* is generally used to denote the entity that has been commented on. An object can be defined as follows[7]:

Object: an object O is an entity which can be a product, person, event, organization, or topic. It is associated with a pair, O: (T, A) where T is a hierarchy or taxonomy of components (or parts), subparts, and so on and A is a set of attributes of O. Each component has its own set of sub-components and attributes.

In practice, both components and attributes are denoted as *features* and this allows to simplify the definition of an object by omitting the hierarchy. In this simplified definition of an object, the object itself is also treated as a feature.

Opinion passage on a feature: the opinion passage on feature *f* of an object evaluated in a tweet *r* is a group of consecutive sentences in *r* that express a positive or negative opinion on *f.*

Opinion holder: the holder of a particular opinion is the person or the organization that holds the opinion. In our case, the tweet holder is the person or the organization that posted the tweet.

Opinion time: opinion time *t* is the time when the opinion is expressed by the opinion holder.

Sentiment or semantic orientation of an opinion: the semantic orientation of an opinion on a feature *f* states whether the opinion is positive, negative or neutral.

Following the above definitions, a regular opinion can be represented as a quintuple,

$$(e_i, a_{ij}, s_{ijkl}, h_k, t_l)$$

Where e_i is the name of an entity, a_{ij} s an aspect of e_i, s_{ijkl}, is the sentiment on aspect a_{ij} *of entity* $e_i h_k$ is the opinion holder, and t_l is the time when the opinion is expressed by h_k The sentiment s_{ijkl} could be positive, negative, or neutral or expressed with different strength/intensity levels, for example, 1 to 5 stars as used by most reviews sites. The representation of a regular opinion can be explained as follows: the opinion s_{ijkl} must be given by opinion holder h_k about aspect a_{ij} of entity e_i at time t_l.

Even though every tweet we collected has all the components of a regular opinion, in this work we are not interested in opinion holders nor time. This helps to have a model of an object and a set of opinions on the object. This is the basic model used in our paper to study the semantic orientations expressed in tweets. It is known as the simplified model of an opinion and it can be described as follow.

An object is represented by a finite set of features, $F = \{f_1, f_2, \ldots, f_n\}$. Each feature f_i in F can be expressed with a finite set of words or phrases W_i, which are synonyms. That is, we have a set of corresponding synonym sets $W = \{W_1, W_2, \ldots, W_n\}$ for the n features. Since each feature f_i in F has a name (denoted by f_i), then $f_i \in W_i$. Each author or opinion holder h_k comments on a subset of the feature $S_j \subseteq F$. For each feature $f_k \in S_j$ that an opinion holder h_k comments on, he/she chooses a word or phrases from W_k to describe the feature, and then expresses a positive, negative or neutral opinion on it.

This model introduces three main practical scenarios. Given a collection of tweets D as input, we have:

Scenario 1: Both F and W are unknown. In this scenario, the opinion analysis requires to perform three tasks:

Task one: identifying and extracting object features that have been commented on in each tweet $d \in D$.

Task two: determining whether the opinions on the features are positive, negative or neutral.

Task three: grouping synonyms of features, as different people may use different words to express the same feature.

Scenario 2: F is known but W is unknown. In this scenario, all the three task for scenario one still 1 to be performed, but task three becomes the problem of matching discovered features with the set of given features F.

Scenario 3: W is known, hence, F is known as well. Here we only need to perform task two above which is to determine whether the opinions on the known features are positive, negative or neutral.

This paper deals with scenario 3 since all features of Galaxy Note 7 are well stated in the manufacturer's manual and all authors of tweets use known and standard names to refer to them.

Last but not least, the final output of sentiment analysis should be in an appropriate format. For each tweet evaluated, its output is denoted as a pair (d, SO), where d is a tweet and SO is the semantic or opinion orientation (positive or negative) expressed in d[13]. To present

the results, we show the number of tweetsexpress positive or negative opinions on each feature and a graph is also used to give a clear view of opinions on Galaxy Note 7 features expressed in tweets[38].

Data exploration

In this paper, we use 19,654 tweets collected in aftermath of Samsung Galaxy Note 7 fiasco using GetOldTweets software [39]. We scrapped twitter to gather tweets posted after the launch of Galaxy Note 7 all along to few days after its killing and removal from the market by Samsung. We used the keyword "galaxynote7" and were targeting tweets posted after its launch, its battery catching fire, call for replacements and exchange program, the release of the software patch to limit it charging capacity to go beyond 60 %, flights evacuation, the ban of taking galaxy note 7 for flights, its removal and killing from the market and few days after its fiasco.

To have a glimpse of information hidden in the collected tweets, we utilize the barplot of frequencies of terms, the wordcloud of terms and the barplot showing the number of tweets falling into each of eight National Research Council Canada (NRC) primary emotions.

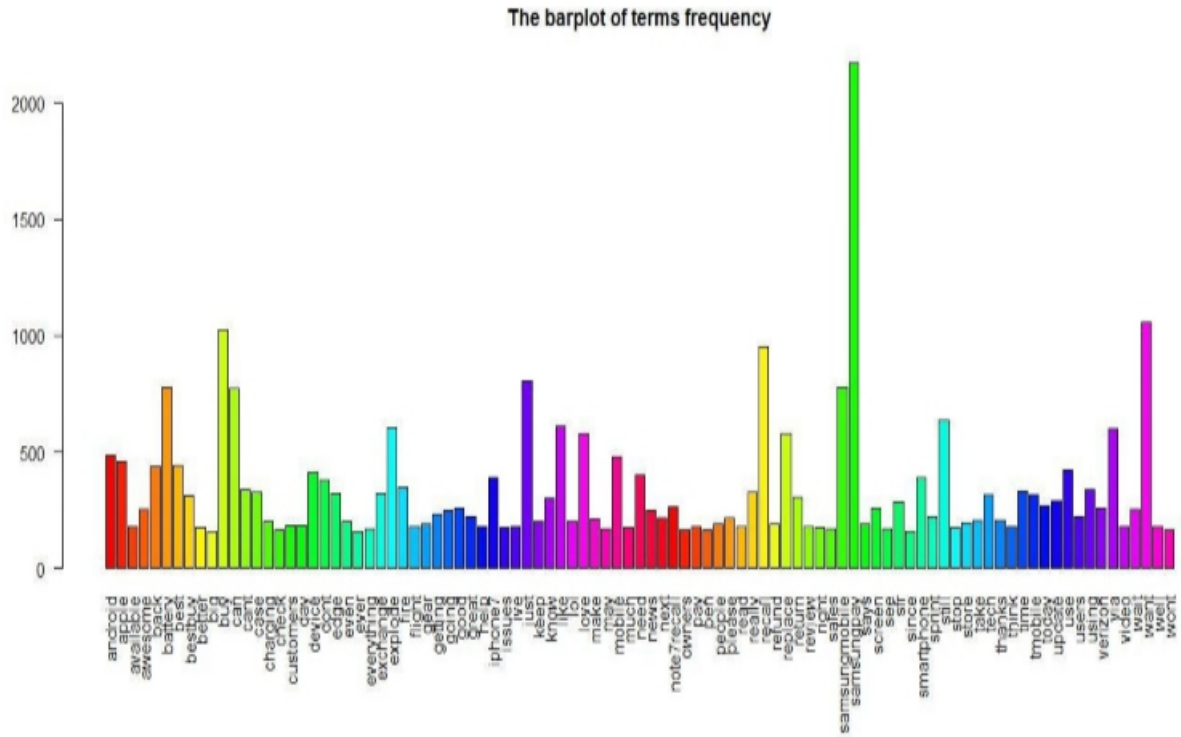

Figure 1: Barplot of terms frequency

On the fig1, we see that terms like Sumsangpay, buy, battery, recall, explode, want etc. have high frequencies are of great significance to our study.

Figure 2: Wordcloud of terms

From the fig2, we can see that terms like Samsungpay, recall, buy, want, battery, replace, explode, love etc. have significant weight and they are the terms occurring often in the tweets about Galaxy Note 7 and significant to our study.

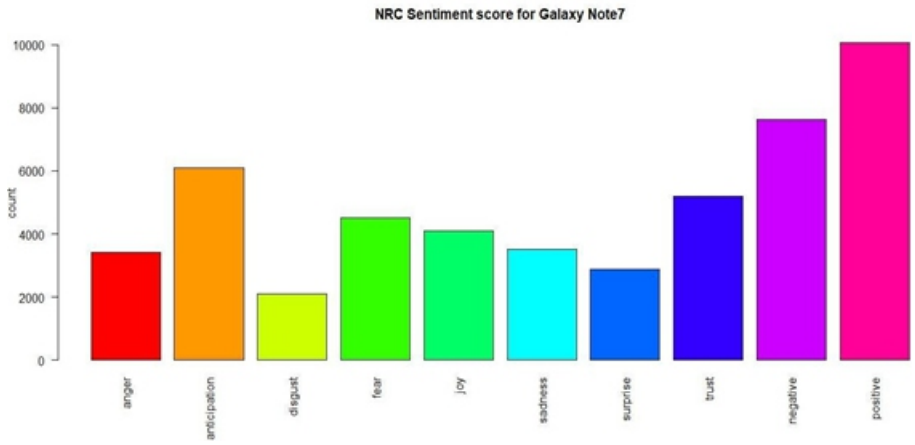

Figure 3: Barplot of the number of tweets corresponding to each of 8 emotions

Emotion is our subjective feelings and thoughts. Emotions are closely rated to sentiments. The strength of a sentiment or opinion is typically linked to the intensity of certain emotions[6]. According to[40]people have six emotions namely love, joy, surprise, anger, sadness,and fear. On the fig3, emotions such as anticipation, trust, fear, and joy count the big number of tweets respectively. It is also revealed that the number of positive tweets is bigger than negative tweets. This would suggest that more tweets authors expressed their opinion on different features of Galaxy Note 7 with optimism and excitement.

Sentiment or semantic orientation score calculation

The lexicon-based approach was used to calculate the sentiment orientation score for each tweet. This method uses opinion words. Opinion words are words that encode a desirable state (positive polarity) e.g. love and awesome or undesirable state (negative polarity) e.g. suck and awful. Opinions words can be adjectives, adverbs, verbs,and nouns as well. In this paper, we used a general lexicon from the authors of [13][38]which are two lists of around 6800 positive and negative words. To calculate the sentiment score of every tweet, we used the following algorithm.

Table 1: Calculation of sentiment orientations using the lexicon-based method

#Initialization of variables
Score = 0, Positive_Score=0, Negative_Score=0,
Negation_Score=0
#Match words with the dictionary containing positive sentiment words
If Word== Positive Word,then
Positive_Score = Positive_Score +1
Else
#Match words with the dictionary containing negative sentiment words
If Word==Negative Word, then
Negative_Score = Negative_Score +1
# Overall tweet score calculation
Score= Positive_Score - Negative_Score
#decide the polarity of the tweet
If Score>0 Then print
"Positive"
Else
If Score < 0 then print
"Negative"
Else
Print "Neutral"

The lexicon-based method in the table1 resulted inhigh precision since it took care of all opinion words found in tweets and used them to calculate sentiment scores. But it also gave low recall since many opinionated tweets which did not contain opinion words as found in the lexicon were classified as neutral.

Extraction of opinion indicators

To solve the problem of low recall suffered by the lexicon-based approach, we extracted opinion indicators from tweets previously found opinionated by the lexicon-based method. The indicator would be a word or token which is not in the original opinion lexicon. We use the Pearson's chi-square test to identify those indicators[41]. The theory behind the chi- square test is that if a term is more likely to occur in positive or negative tweets, it more likely to be an opinion indicator. Our task here is to find out how dependent a term *t* is with respect to the positive or negative tweets. Our null hypothesis is that that the candidate indicator *t* is independent of positive/negative tweets with respect to its occurrences in the two sets. The Pearson's chi-square test compares observed frequencies of *t* to its expected frequencies to test the hypothesis.

Table 2: The contingency table for chi-square

	With *t*	Without *t*	Row Total
Positive tweets	f_{11}	f_{12}	$f_{11}+f_{12}$
Negative tweets	f_{21}	f_{22}	$f_{21}+f_{22}$
Column total	$f_{11}+f_{21}$	$f_{12}+f_{22}$	

In the table2, f_{ij} represents indicator frequency in the positive/negative tweets. For instance, f_{21} indicates the count of tweets which contain the candidate indicator *t* in negative tweets.

The chi-square value is computed as follow[9]:

$$X^2(w) = \sum_{i=1,2} \sum_{j=1,2} \frac{(f_{ij} - Eij)^2}{Eij}$$

Where Eij is the expected frequency of f_{21} and is calculated as follows:

$$Eij = \frac{\text{row total}_i \times \text{column total}_j}{f_{11}+f_{12}+f_{21}+f_{22}}, i, j \in \{1, 2\}$$

Finally, we select the indicators with larger chi-square value since the larger the chi-square value, the more dependent *t* is with respect to the positive or negative tweets. We select an opinion indicator if it has a chi-square weight greater than zero.

Sentiment classifier and hybrid method

In this section, we deal with the last step of the hybrid method which is to train a binary classifier with the newly-indicated opinion indicators. We use Support Vector Machines (SVMs) from the kernlab library [42] as the learning algorithm. Our training data are the newly opinionated indicators and no any opinion indicator originally found in the lexicon of opinion words (positive or negative sentiment

words) is used in order to avoid the training bias towards them. That is, the training data consists only of context words.

The hybrid method combines the lexicon-based method and the machine learning-based method to identify the polarity for more opinionated tweets than the lexicon could, hence, the recall is improved. The following is the algorithm to implement the hybrid method:

Table 3: The hybrid method to identify overall opinionated tweets

#Initialization of variables
Score = 0, Positive_Score=0, Negative_Score=0,
Negation_Score=0
#Match words with the dictionary containing positive sentiment words
If Word== Positive Word, then
Positive_Score = Positive_Score +1
Else
#Match words with the dictionary containing negative sentiment words
If Word==Negative Word, then
Negative_Score = Negative_Score +1
# Overall tweet score calculation
Score= Positive_Score - Negative_Score
#decide the polarity of the tweet
If Score>0 Then print
"Positive"
Else
If Score < 0 then print
"Negative"
Else
Print "Neutral"
#select additional opinion indicators from opinionated tweets classified by the lexicon-based method.
Opinionated_tweets=positive tweets + negative tweets
Context_words=opinionated_tweets – matched_lexicon_terms
Chi_square_weights= pearsons_chi_square(context_words)
Additional_opinion_indicator=chi_square_weights>0

#Train SVMs classifier and identify additional opinionated tweets

SVM_model=ksvm (Additional_opinion_indicator)

Predictions= predict (neutral_tweets)

Additional_opinionated_tweets=non_neutral_predictions (predictions)

#Overall opinionated tweets

Overall_opinionated_tweets=opinionated_tweets+additional_opinionated_tweets

4. EXPERIMENTAL RESULTS AND DISCUSSIONS

In this paper, we used the hybrid method which is a combination of the lexicon-based method and machine learning-based method to sentiment classification. The primary goal of the hybrid method is to identify more opinionated tweets, hence, solve the problem of low recall suffered by the lexicon-based method[1], [9], [11], [12], [23], [43]. The results of our experiments show the number of opinionated tweets identified by each method and the number of positive or negative tweets posted about each feature of the Galaxy Note 7.

Table 4: opinionated tweets identified by each method

Sentiment analysis method	**The number of opinionated tweets identified**		
	Positive tweets	Negative tweets	Overall opinionated tweets
Lexicon-based method	5771	4192	9963
Machine learning (additional tweets)	4381	145	4463
Hybrid method	10152	4337	14489

From the table4, we realize that the hybrid method improved the recall of the lexicon-based method dramatically by identifying other more 4463 opinionated tweets. The table4 also shows that 10152 positive tweets and 4337 negative tweets about the Galaxy Note 7 were posted by different authors. That is, a big number of tweet authors were willing to post positive opinions on Galaxy Note 7.

Our experimental results also show the number of positive and negative tweets posted about each of the most prominent features of the Galaxy Note 7[44], [45].

Table 5: The number of positive or negative tweets posted about Galaxy Note7 features

Features	Identified opinionated tweets		
	Positive tweets	Negative tweets	Overall tweets
Galaxy Note 7	**10152**	4337	14489
SamsungPay	**1946**	86	2032
Screen	**179**	42	221
Battery	128	**392**	520
Charging	**179**	48	227
Camera	**122**	29	151
Pen	**134**	14	148
Iris recognition	**95**	10	105
Fingerprint	**5**	3	8
MicroSD card	**14**	0	14
HDR-color	**11**	2	13
Gorilla glass	16	**21**	37
RAM	**18**	4	22
GearVR	**216**	16	232
Exynos chip	**17**	5	22
Marmallow OS	**7**	0	7
Touchwiz	**34**	2	36
GIF creator	**31**	11	42
Securefolder	**11**	0	11
Grace UX	**20**	0	20
Waterproof	**63**	34	97
Size+design+weight	39	**50**	89

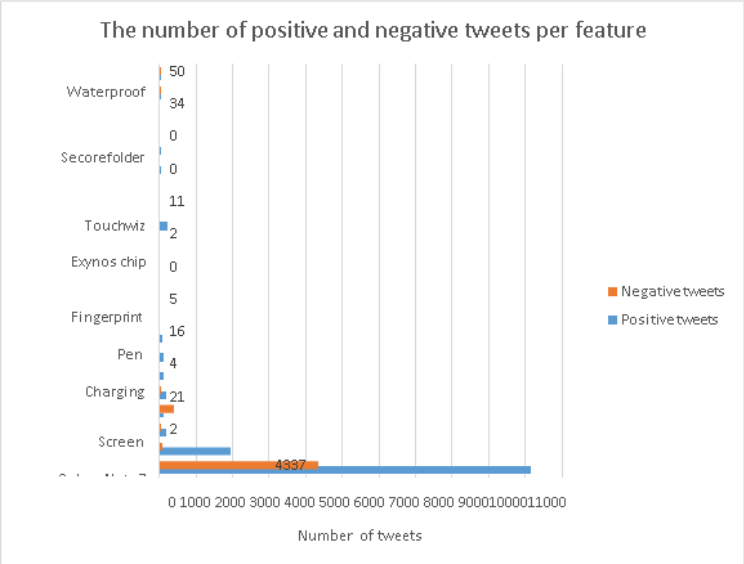

Figure 4: The number of positive and negative tweets per feature

The results in the table5 and the figure4 reveal most of the Samsung Galaxy Note 7 was commented on positively except the battery, gorilla glass, feeling (Size, design,and weight) with 264, 5, 11 negative tweets more compared to positive tweets respectively. The numbers on figure4 show negative tweets since their small numbers can be hard recognized easily following the chat bars.

The figure3, table4 and table5 results all show that more positive opinions were tweeted about the Galaxy Note 7 and its features. That is something stunning considering that this brand of the phonewas removed from the market and killed completely by Samsung. This really shows the potential that was behind this fabulous android phone that pushed many users to resist getting rid of it in exchange to other Samsung phones or money even though it was branded explosive following may of its reports blowing up cars and rooms and flights evacuation following its lithium ions battery catching fire.

5. CONCLUSIONS

With many people able to access the web and willing to post more tweets about different entities like products, events, people, etc. Sentiment analysis on tweets has become a rapid and effective way of gauging opinion for business marketing or social studies.

In this paper, we performed sentiment analysis on the tweets posted in the aftermath of the Samsung Galaxy Note 7 fiasco to find out whether this phone and its features were commented on more negatively or positively by Tweeter users and see whether its removal from the market and killing by Samsung was dictated by the negative opinions expressed by the customers. Hence, the question, only thumbs down? We used the hybrid method which is a combination of lexicon-based method and machine learning-based method to solve the problem of low recall suffered by the lexicon method and find out the answer to our question.

In this paper, we found that the Galaxy Note 7 and its features received more positive than negative opinions, and this justifies the reason why this phone was received with great acclamation and labeled by some customers as the top Android phone of its time. We could argue that the Galaxy Note 7 and its features except its battery were not as bad as some people might think after getting across the story of such a fabulous phone that lived such a very brief and sulfurous life. Hence, not only thumbs down for the Galaxy Note 7.

Acknowledgements: We would like to thank Prof. Jing Liu, for the patient guidance, encouragement and advice she provided for the completion of this paper.

Author Contributions: Janvier conceptualized the paper idea, designed the research design and carried out computations. Ellen, Roger and Evariste carried out data collection, data analysis, and paper writing.

Conflicts of Interest: The author declares no conflict of interest.

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