Analysis of Operating Systems and Browsers: A Usage Metrics

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Abstract

Purpose: *The purpose of this paper is to examine the growth of FOSS and proprietary operating systems and browsing software used in computers and various types of mobile phone devices around the world.*

Design/Methodology/Approach: *The data is gathered from StatCounter (http://gs.statcounter.com) - one of the biggest web analytics service. The collected data is analysed keeping objectives of the study in view.*

Findings: *It offers a thorough insight of yearly and cumulative growth of software industry. As for as OS market is concerned Mac OSX and Linux have increased their share. Linux has increased from 0.69% in 2009 to 0.78% in 2010. Accordingly year wise growth of mobile operating systems show iOS is losing its market share by dipping to 25.48% in 2010 from 34.01% in 2009, while as BlackBerry and Android have increased their share by 8.34% and 6.41% respectively. Browser Internet Explorer (IE) is showing declining trend with 52.77% share in May, 2010 against 44.52% in April, 2011, whereas Firefox is maintaining a study trend during same period with 31.64% share in May, 2010 with slight depreciation (29.67%) in May, 2011. However, in mobile browser arena all the browsers are showing a declining trend in 2010 when compared to 2009 except Android, BlackBerry, Samsung and NetFront. BlackBerry has increased by 8.15% and Android- an open source mobile browser has increased its market share by 6.63% augurs well for FOSS movement.*

Originality/Value: *The paper explore the market share of FOSS in OSs and browsers. It deciphers in detail the FOSS growth and increasing market share and can help stakeholders to take future course of action in this arena.*

Keywords
FOSS, Proprietary Software, Operating Systems, Web Browsers – Mobile, Web Browsers – computer

Paper Type: *Research paper*

Introduction

O pen Source software can be analysed as a process innovation: a new and revolutionary process of producing software based on unconstrained access to source code as opposed to the traditional closed and property-based approach of the commercial world. The production of Open Source software is a form of intellectual gratification with an intrinsic utility similar to that of a scientific discovery, involving elements other than financial remuneration **(Perkins, 1999)**. Emerging as it does from the university and research environment,

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the movement adopts the motivations of scientific research, transferring them into the production of technologies that have a potential commercial value. The sharing of results enables researchers both to improve their results through feedback from other members of the scientific community and to gain recognition and hence prestige for their work. The same thing happens when source code is shared: other members of the group provide feedback that helps to perfect it, while the fact that the results are clearly visible to everyone confers a degree of prestige which expands in proportion to the size of the community.

In the new paradigm of development, programmers frequently rediscover the pleasure of creativity, which is being progressively lost in the commercial world, where the nightmare of delivery deadlines is transforming production into an assembly line. Proprietary software is primarily perceived as not being very reliable. Produced by a restricted group of programmers in obedience to market laws, it is in diametric opposition to the law expressed by **Raymond (1999)**: "Given enough eyeballs, all bugs are shallow". So it can be safely concluded that Intellectual gratification, aesthetic sense, and informal work style are all recurrent features of the set of different motivations underlying the invention of Open Source.

Over the years use of free and open sources software has increased considerably in every sphere of human activity like education, industry, business, medicine, agriculture etc. It has given strong competition to the proprietary software and is also encouraged at government level in different developing and emerging economies of the world due to its umpteen benefits. FOSS advocate groups round the globe promote its use and motivate programmers to develop new applications for human good. sourceforge.net is on such platform which has united programmers from different countries to develop and improve FOSS in range of areas. Even after umpteen efforts by volunteers proprietary software industry is occupying lion's share in the market place and is expected to be a dominant player in future as well but endeavours by FOSS advocate groups could be very important for weaker economies and underdeveloped societies therefore should be encouraged.

Problem
The study is an endeavour to understand and appraise the use of different open source and proprietary browsers and operating systems used in computer and mobile phone devices around the globe.

Scope
The scope of the study is confined to assess the growth and use of Proprietary and FOSS operating systems and browsers in computer and

mobile phone devices around the globe. The study covered the period of 2009 and 2010 to gauge cumulative growth and April, 2010 to May, 2011 for analysing latest trend.

Objectives

- ➢ To understand the use and growth of proprietary and FOSS computer operating systems and browsers.
- ➢ To assess the use and growth of proprietary and FOSS mobile operating systems and browsers.
- ➢ To measure the cumulative growth of these software during 2009 and 2010.

Methodology

The data is gathered from StatCounter (http://gs.statcounter.com) which is the one of the biggest web analytics service in the form of .csv files. The data as such collected is analysed and compressed keeping objectives of the study in view.

Limitations of the study

StatCounter tracking code is installed on more than 3 million sites globally. Every month, more than 15 billion hits are recorded to these sites even then the data collected do not claim to be sole representation of whole internet user community.

Related work

Lehman et al. have built the largest and best known body of research on the progressive use of large, long-lived software systems **(Lehman, & Belady, 1985; Lehman M. et al., 1997; Lehman, Perry & Ramil, 1998; and, Turski, 1996)**. Lehman's laws of software evolution, which are based on his case studies of several large software systems, suggest that open source systems are growing in size. **Turski's (1996)** statistical analysis of these case studies suggests that system growth (measured in terms of numbers of source modules and number of modules changed) is usually sub-linear, slowing down as the system gets larger and more complex. **Kemerer and Slaughter (1999)** have presented an excellent survey of research on software development. They also note that there has been relatively little research on empirical studies of software progression. **Parnas (1994)** has used the metaphor of decay to describe how and why software becomes increasingly brittle over time. **Eick et al., (2001)** extend the ideas suggested by Parnas by characterizing software "decay" in ways that can be detected and measured. They used a large telephone switching system as a case study. They suggest, for example, that if it is common for defect fixes to require changes to large numbers of source

files, then the software system is probably poorly designed. Their metrics are predicated on the availability of detailed defect tracking logs that allow, for example, a user to determine how many defects have resulted in modifications to a particular module. We note that no such detailed change logs were available for our study of Linux. **Perry (1994)** presented evidence that the use of a software system depends not only on its size and age but also on factors such as the nature of the system itself (i.e., its application domain), previous experience with the system, and the processes, technologies, and organizational frameworks employed.

Pfaffman (2008) observes that though many educators are unaware or dismissive of Free/Open Source Software, the number of FOSS tools continues to grow. According to him as Netscape released the source code to its Netscape Communicator package. Netscape's decision resulted in Mozilla, a full-featured suite of software and, subsequently, the Firefox web browser. These Open Source programs continue to benefit Netscape's commercial products. Similarly, Google's servers run the FOSS Linux operating system; when Google's programmers find problems and their solutions, those solutions are given back to the community so that all may benefit from them.

Pearson (2000) concludes that Linux operating system has now reached the stage where it is being adopted commercially by the big computer manufacturers, as a competitor to the Microsoft proprietary Windows operating system in the server market. Mozilla and other important open source software Apache, which runs a majority of Internet servers, SendMail Internet E-mail software and Perl, the standard Internet scripting language. One variant of UNIX, the Berkeley BSD Unix, has been open source for many years.

The market share of Windows NT has increased from 25.6% in 1996 to 41.9% in 2003, while the market share of Linux has also increased from mere 6.5% in 1996 to 38.0% in 2003. Indeed the honour of open source software speaks for itself in the busy world of information technology. Apache Web server has over 60% of market share, it's nearest rival Microsoft's IIS server has only a 25% share **(Bitzer, 2004)**.

With a reputation for speed, reliability, and efficiency, GNU/Linux now has more than 12 million users worldwide and an estimated growth rate of 40% per year (www.linux.org). With more than one-half of Fortune 500 companies now using GNU/Linux instead of Microsoft's proprietary software, the market threat of F/OSS to Microsoft is more evident. With the recent surge in the use of GNU/Linux by individuals and companies, is it possible that users of F/OSS could eventually surpass those using Microsoft's proprietary software **(Elliott and Scacchi, 2008)**

Analysis and discussion
**Operating Systems Growth – Global Scenario**
➢   **Operating Systems - Monthly Use**
With the launch of new version of Windows OS i.e. Windows 7, growth of Windows XP has declined from 58.02% in May, 2010 to 46.57% in April, 2011 and growth of Windows 7 has increased from 14.84% in May, 2010 to 31.91% in April, 2011. While as growth of Windows Vista has declined but of Mac OS has remained stable for the same period. Linux, an open source operating system, has shown a slight declining trend.

Fig.1.1: Monthly Growth of Operating System
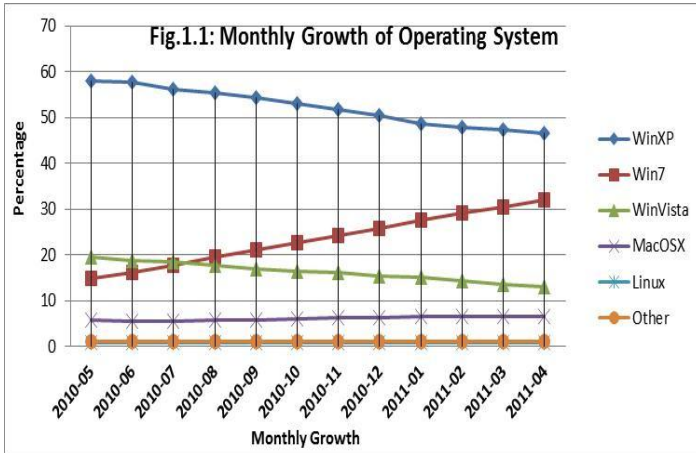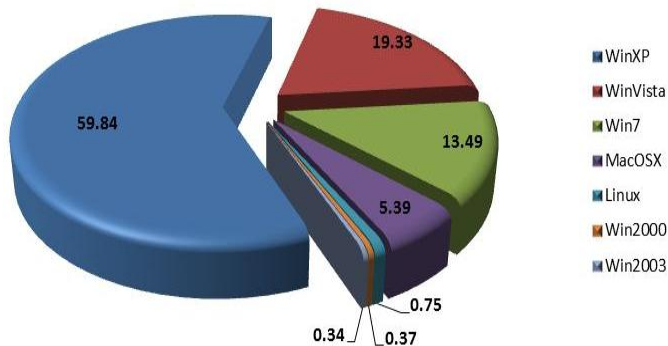
➢   **Operating Systems - Yearly Use**
Use of Windows XP has decreased from 69.57% in 2009 to 56.11% in 2010. Similarly, use of Windows Vista has also decreased. Windows 7, obviously, has increased its usage. Mac OSX and Linux have increased their share. Linux has increased from 0.69% in 2009 to 0.78% in 2010.

Fig.1.2: Year-wise Growth of Operating Systems
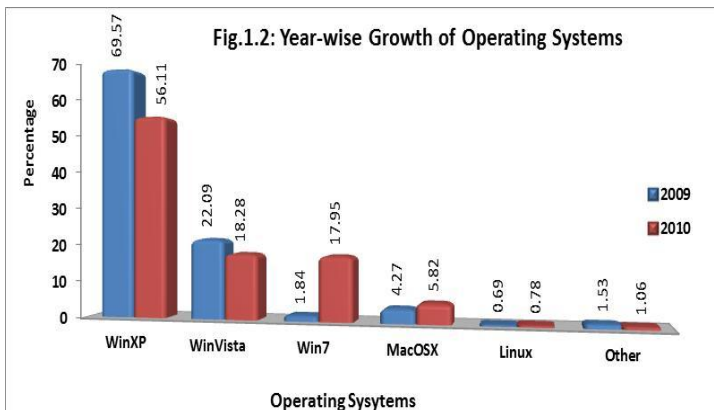
➢ **Operating Systems –Cumulative Use (2009 – 2010)**

The overall use of operating system shows that Windows XP is the dominant OS in the market with 59.84% market share followed by Windows Vista with 19.33%. Newly entered Windows 7 is at the 3rd place (13.49%) within few months of arrival and Mac OSX is at 4th place. Linux is having a meagre 0.75% share for this period is little used by people throughout the world but nevertheless is increasing its share. The dominancy of Window based O.S is quite vivid and may stay for a long time to come due to its user friendly features and partly strong promotional marketing.


Fig.1.3: Overall Use of Operating Systems for 2009 - 2010

Mobile Operating Systems – Global Scenario

➢ **Mobile Operating Systems - Monthly Use**

Monthly use of mobile operating systems shows that Symbian operating system (OS) is maintaining a steady growth. This is followed by iOS which is showing a declining trend as it was having 29.01% share in May, 2010 against 23.34% share in April, 2011. BlackBerry OS shows a fluctuation as it increased from 14.15% in May, 2010 to 19.25% in November, 2010 and then decreasing to 13.54%. Open source operating system Android has shown a tremendous growth by jumping from 3.94% share in May, 2010 to 16.05% share in April, 2011. Android OS has surpassed BlackBerry in Feb, 2011 and is the only open source operating system among the top ranked. A vivid picture is provided in **Fig 2.1.**

Fig.2.1: Monthly Use of Mobile Operating Systems
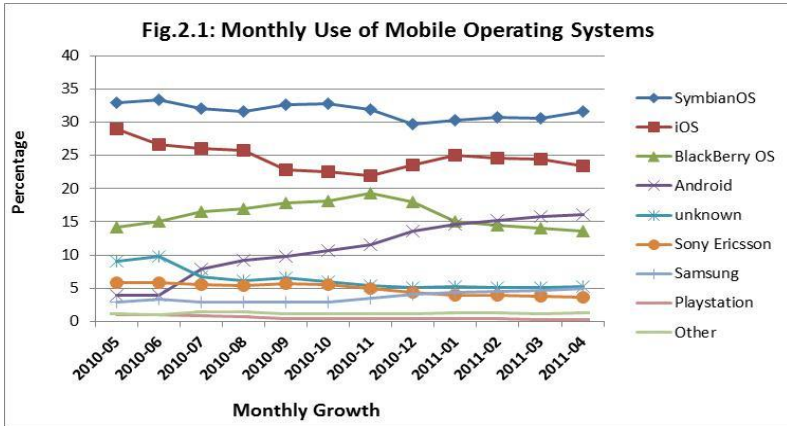
➢ **Mobile Operating Systems - Yearly Use**

Symbian OS, being the most used OS, has lost its market from 35.49% share to 32.29% due to the entry of new OS in the market. Year wise growth of mobile operating systems show that iOS is losing its market share by dipping to 25.48% in 2010 from 34.01% in 2009. BlackBerry and Android have increased their share by 8.34% and 6.41% respectively. The growth of other mobile OS can be seen from the fig.8. The increased market share of android is quite encouraging and is expected go further up in near future given the fact more mobile companies are keen to adopt android for their upcoming smart phones.

Fig.2.2: Year Wise Growth of Mobile Operating Systems
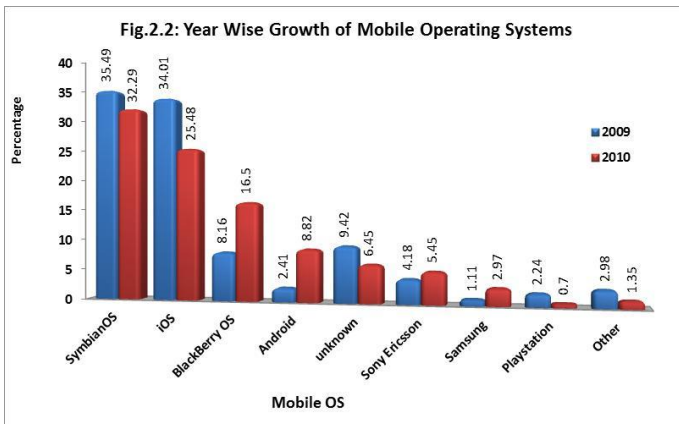
➢ **Mobile Operating Systems - Cumulative Use (2009 – 2010)**

Symbian OS has the highest market share among all mobile OS with total share of 32.65%. It is followed by iOS BlackBerry with 26.46% and 15.54% share respectively. Android, the open source OS has retained the 4th

place with total share of 8.08% for 2009 and 2010. Sony Ericsson and Samsung are holding 6th and 7th spots respectively. The other open source mobile OS in the list include Linux but is having a negligible share of 0.01%. With the presence of two variants of open source OS the growth of FOSS OS can be expected to improve.


Fig.2.3: Overall Use of Mobile Operating Systems For 2009 - 2010
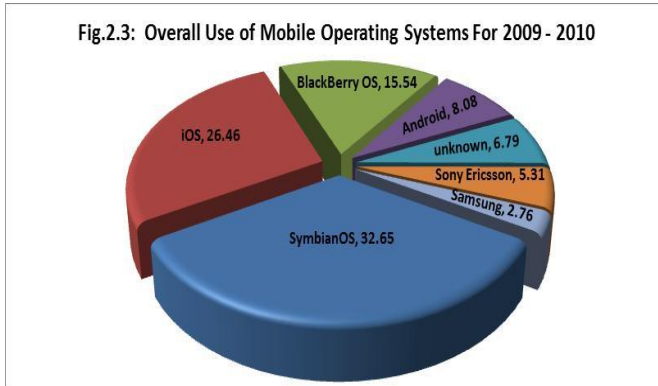
**Web Browsers – Global Scenario**
➢ **Web Browsers - Monthly Use**

The global scenario of web browsers use from May, 2010 to April, 2011 shows that Internet Explorer (IE) is showing declining trend with 52.77% share in May, 2010 against 44.52% in April, 2011 whereas Firefox is maintaining a study trend during same period with 31.64% share in May,2010 with slight depreciation (29.67%) in May, 2011. Open source browser - Firefox is followed by Chrome which is showing a huge increase in usage growing from meagre 8.61% to 18.29%. Safari and Opera hold 4th and 5th positions with a study growth. Since all browsers are free in nature the use of proprietary browsers due to strong marketing background is not unusual phenomenon while open source browser Firefox is occupying 1/3rd of market share is a good sign for the promoters of open source movement.
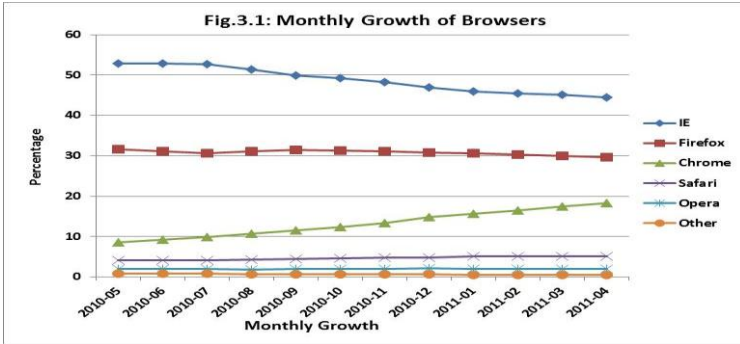
> ➢ **Web Browsers - Yearly Use**

IE was used more in 2009 (59.71%) than in 2010 (51.45%) while as use of Firefox is observed more in 2010 with 31.27% users worldwide against 30.48% in 2009 indicating steady growth. Likewise Chrome increased its users from 3.27% (2009) to 10.25% (2010). The figure below shows the usage of other browsers in 2009 and 2010 as well.
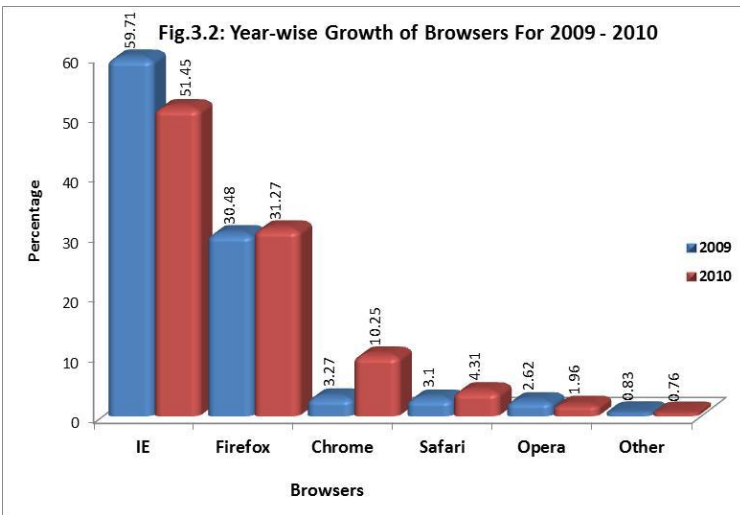
> ➢ **Web Browsers - Cumulative Use (2009 – 2010)**

IE (53.74%) was the most used browser for 2009 and 2010. Firefox (31.24%) holds the 2nd spot followed by Chrome (8.32%) and Safari (3.97%) while as Opera has 2.14% share. Among the other open source browsers SeaMonkey (0.03%), Flock (0.02%) Camino (0.01%), Konqueror (0.01%) and Minefield (0.01%) are also showing their presence in the list of browsers but with meagre use. Firefox's strong presence as an open

source browser augurs well and is expected to increase its share due fast accessibility feature and regular updates.

Fig 3.3. Overall use of browsers for 2009-2010
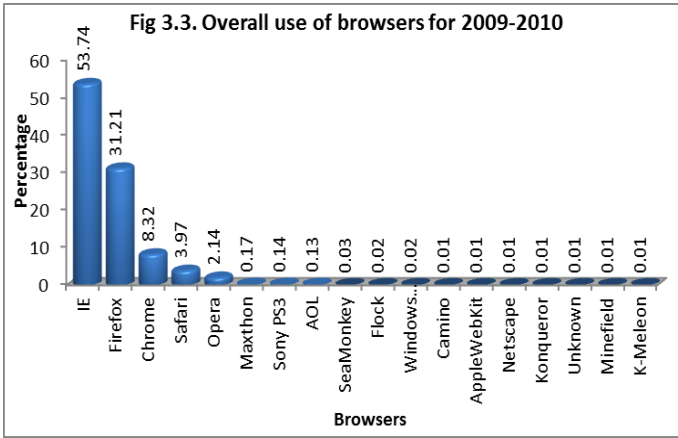
Mobile Browsers – Global Scenario
> ## Mobile Browsers - Monthly Use

The growth of Opera browser, the leading mobile web browser has declined from 26.68% in May, 2010 to 21.9% in April, 2011.iPhone and Nokia have maintained a steady trend but the growth of BlackBerry is declining after touching the peak in November, 2010. The interesting thing is that Android, only influencing open source mobile browser, has increased its share from meagre 6.3% in May, 2010 to 15.49% beating BlackBerry and inching toward Nokia and iPhone.

Fig.4.1: Monthly Growth of Mobile browsers
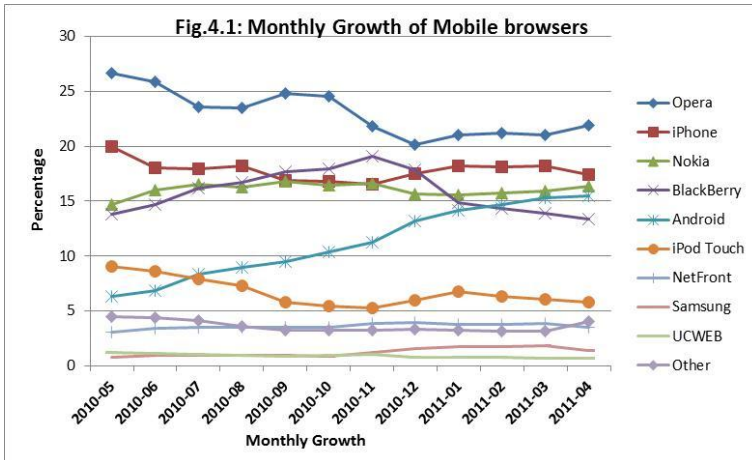
➢ **Mobile browsers - Yearly Use**

Use of Opera browser has declined in 2010 (23.9%) as compared to 2009 (25.33%) but still retains the top spot. Almost all the other browsers are showing a declining trend in 2010 when compared to 2009 except Android, BlackBerry, Samsung and NetFront. BlackBerry has increased by 8.15% while as Android, open source mobile browser has increased by 6.63% showing a good promise in the near future.

Fig.4.2: Yearly Growth Mobile browsers during 2009 - 2010
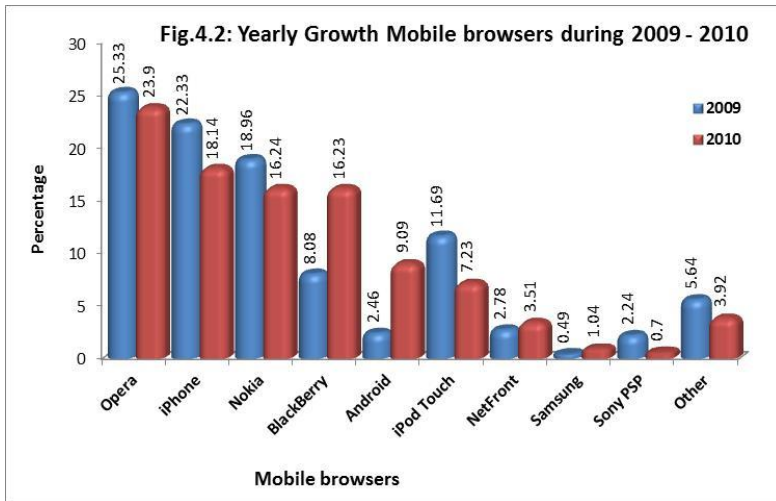
➢ **Mobile Browsers - Cumulative Use (2009 – 2010)**

For the last 2 years, Opera has maintained the first position with 18.63% share while as iPhone, Nokia and BlackBerry hold 2nd, 3rd and 4th places. Android is the lone open source browser among the top 7 mobile browsers as shown in the **Fig. 4.3.**

Fig.4.3: Overall Use Of Browsers for 2009 -2010
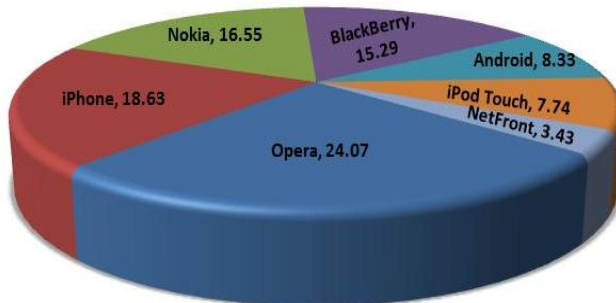
Conclusion

The growth of FOSS operating systems and browsers in global market augurs well, though there is a plenty of scope for the open source software to expand its reach to length and breadth of the software industry given the fact Microsoft have dominant market share among operating systems and seems it does not confront some tough competition is near future. However, same cannot be said about browsers as OSS Firefox has already occupied 1/3rd of market approximately giving tough time to proprietary software companies. While as proprietary software are dominant among mobile operating systems with marginal presence of Android. But given the hype and success android has gained in a short period and predictions by experts that android shall occupy future mobile operating system marketing promises well. Although same cannot be said about the mobile browsers where free mobile bowser Opera runs supreme with promising growth of BlackBerry and OSS Android.

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