***ABSTRACT***

*In the last few years open source software products have become mature*

*alternatives to commercially developed software and systems but do not seem to be a viable commercial option for leading software vendors because of its freely available source code. However, market trends seem to paint a different picture. While open source software has matured almost to the point where it is set to challenge Microsoft's dominance in a number of areas, paradoxically, the open source model seems at odds with this reality. Nevertheless, the open source movement has been endorsed by many key industry players who would not do so unless there was a valid commercial reason. This open-minded position is difficult to understand because the business community is still dependent on proprietary software. In this paper, various reasons that have been advanced for and against the adoption of open source systems by developing economies and the open source business model along with its economic implications is presented. The focus is the effect on the end users, software developers and government policies. The paper concludes by examining the Nigerian situation and offering suggestions on how Nigeria and other third world economies can benefit from this seemingly global paradigm shift.*

**Introduction**

Open Source Software (OSS) has begun to emerge in developing nations as an alternative to proprietary software. Its popularity is dependent on the promise of cost reduction, because open source software is usually available without license costs. However, proponents of OSS argue that there are other long-term benefits, for example the creation of stronger local ICT (Information and Communication Technology) industries. Although many developing countries have recognized the benefits of adopting OSS, formulating policy that favors OSS has met with some resistance.

OSS critics argue that the GNU General Pubic License (GPL) hampers local software development, rather than encouraging business, that there are fewer hardware drivers for OSS operating systems, and proprietary software like Microsoft products are easier to install and configure. OSS has gradually made its way into the main stream of ICT business and commerce. The proprietary vendors, rather than dismissing OSS as a difficult to configure software put together by an unruly group of hackers on the Internet, have been made to acknowledge the emergence of OSS as strong competition to existing products and traditional business models. Especially on the server computers, OSS has proven its capability to provide stable, high quality applications (Wheeler, 2003).

In developed nations, especially in the United States (U.S.), software has made a significant impact on the economy. If the U.S. experience could be translated to other countries, even on a smaller scale, the potential impact could be large. Hence, the interest in a low-cost means of developing a local software industry is easily understandable. In the 30 years between 1970 and 2000, the U.S. software industry grew at an astonishing rate of 38 percent annually (Wheeler, 2003). By the year 2000, annual software sales to end-users in the U.S. were more than $100 billion (USD). Even after leveling off a bit in the mid-1990s, the software industry grew at roughly three times the rate of the economy as a whole, even while the general economy itself was booming. As a percentage of total GDP, the software industry in the U. S. is actually relatively small. Nonetheless, as a percentage of total exports the effect of the software industry on the economy is much higher. The software industry ran a trade surplus of $13 billion in 1997; without software’s contribution, the U.S. trade deficit would have been 36 percent higher (Debroy & Morris, 2004).

However, a digital divide continues to exist between developed and developing countries. Considering for example China’s software industry, which is still relatively small, it constitutes roughly 2% of the Worlds software industry, whereas the U.S. market share is 40% and Europe’s market share is 31%. In the U. S. 97% of software is provided by local companies whereas in China local companies provide only one third. In 2002, China’s total software industry revenue is about $13.3 billion (USD), which is insignificant when compared with developed countries when considering China’s 1.3 billion people, which constitutes more than one-fifth of the world’s population (Wuqiang, 2003). Some key issues that have been raised that are vital for establishing the worth of Open source in the context of development. These are can developing countries create value through OSS? What are the barriers to OSS? Moreover, what practical approaches can be encouraged? There is a need to address these issues if OSS is to develop in Africa and have the potential to bring benefits to the economy and society.

**Adoptation of Open Source Software in Developing Economies**

This paper with a general assumption that majority of us seating here today are youths. This assumption is necessary in the lights of the overall theme for this gathering which is "Building Intellectual capacity for sustainable development in the new order of Economy" It is almost impossible to discuss development in whatever context outside the youth.

The youthrepresent the largest and most active percentage of any nation `s work force . The united Nations put the population of the country at roughly 115 million in year 2000. Of this immense population, the largest in any black world, youth account for 60%. Further statistic revealed that young people between the age bracket of 12 and 30 years constitutes 46% of the population i.e. almost 52 million people. This sheer huge size, of necessity, logically confers on the youth a prime position in the scheme of things of any nation.

Providing the right man power to nation building is a key sector that cannot be ignored by any segment of the society. It is the fulcrum on which development and nation building stands and the relevance of youths.

Nation building is an hydra headed concept entailing economic reconstruction, political transformation, cultural discovery and spiritual renewal. Development and nation building sprout from a seed of modernism that has been introduced, integrated and adapted to the traditional society. Youths generally the most feasible contact with the modern world and hence they are change-agents, the human vehicle through which seed of modernism are not only conveyed but sown.  
They are the principal mechanism for unity and friendship which are essential ingredient for nation building.

Youth is about renewal, fresh ideas challenging old traditions (with humility) and yearning for the untried. Youths find change inebriating, not intimidating. youths are impetuous, sometimes unpredictable: with the promise of a better future comes a veiled threat to tear down the past. Youth breaks all the rules. We are vanguard of fashion, music, literature and popular culture. Youth is, in a word, energy potential dynamite set to be unleashed.

It is therefore for me, a pleasure for which I am sincerely grateful, to be part of this ICT4NEED workshop taking place in the town of Ado-Ekiti.

**Nigeria IT industry; Developing the Skills in Open Source alternatives**

On March 15, 2004, the present regime released to the public the Nigeria National Economic Empowerment and Development Strategy (NEEDS) document. The document has the following as its ICT policy focus:

* To develop and sustain a modern information and communication technology capacity that is conducive to private sector driven growth and economic development, improve quality of life and impact the level of poverty significantly.
* Improve access to Internet connectivity and raise the level of computer usage and literacy
* Facilitate the development of a national multimedia super corridor including provision of appropriate incentives for private sector involvement

Aggressively promote ICT as an instrument of mass education, growth and development.

In achieving the aforementioned objectives, the document identified the following issues as critical to improved information and communication services.

1. High cost of private provision of power.
2. Absence of local manufacture and maintenance of information and telecommunication equipment including development of a software development capacity.
3. Absence of an effective and efficient postal communication and
4. Inadequate human capacity and indigenous technical know-how

Our focus in this paper will be such to address the fourth constrained mentioned above: Inadequate human capacity and indigenous technical known-how. Our tool for addressing this problem is the Free and Open Source alternative.

**What is FOSS**

FOSS is simply an acronym for Free and Open Source Software. Free software is that which the creators of computer software convey rights to others to freely use, redistribute, and modify their work. This results in a broad public collaboration on such works.

Tan T. and Kuala L. (2004) defined Free/Open Source Software as software that is made available along with source code as a distinctive feature. It is often available at no cost. Users can and distribute the software. And if they so wish, they can study the source code and modify it to suit their needs. The modified version of the software can also be redistributed. In contrast, proprietary software is licensed to users for a fee and the source code is usually closely guarded and not made available to users. It is illegal to make copies and distribute proprietary software without paying additional licensing fees.

There is a fine distinction between Free Software and Open Source Software. The Free Software movement focuses on moral and ethical issues relating to the freedom of users to use, study, modify and redistribute software. Open Source advocates take a more corporate approach, focusing on the advantages of the Open Source software development method. For most purposes including this paper, Free Software and Open Source Software can be considered to be the same. Free and Open software are simply put, two different sides of same coin.

Open Source, according to the open source initiative, is any software that complies with the following characteristics

**Source Code**

  This software come with the source code, and allows distribution of same. Where some form of the product is not distributed with the source code, there is a well-publicized means of obtaining the source code which is usually downloading it via the Internet without charge .The source code is provided in the form in which a programmer would be able to modify the program.Obscure source codes or Intermediate forms such as the output of a pre-processor or translator are not allowed for OSS.

**Free Redistribution**

The license does not restrict any party from redistributing or giving away the software as a component of an aggregate software distribution containing programs from several different sources. The license does not require a royalty or other fee for such distribution.

**Derived Works**

  The license allows modifications and derived works, and also allows them to be distributed under the same terms as the license of the original software.

**No Discrimination against Persons, Groups and Fields of Endeavour**

The license does not discriminate against any person or group of persons. It does not also restrict anyone from making use of the program in a specific field of endeavour .For example, it does not restrict the program from being used in a business, or from being used for genetic research. It is meant for everyone and, in every field of endeavour.

**License Must Not Restrict Other Software**

 The license does not place restrictions on other software that is distributed along with the licensed software. For example, the license does not insist that all other programs distributed on the same medium must be open-source software.

**License Must Be Technology-Neutral**

The provision of the license is never predicated on any individual technology or style of interface

**Open Source and Propriety Software**

Proprietary software or closed software as distinct and different from Open source is that which user has to obtain license for it to be use. In almost all cases, the source codes for proprietary software are not publicly available. Microsoft and Oracle are the two world largest software vendors.

It has been argued for the under listed reasons that Open Source is technically superior to proprietary software. The reasons are:

1. Developments in a proprietary organization are mostly ill-targeted because developers are mainly not users, and therefore do not know which functionalities to develop or improve first, or simply where the bugs are. On the contrary, open-source communities benefit considerably from a "users as innovators" organization and attract numerous heterogeneous developers which, using their own idiosyncratic experience, correct various bugs and suggest various new developments. As a consequence, developments added to open-source software are considerably more efficient for a given level of adoption than for proprietary software.
2. Proprietary software producers get incentives to release improved versions only from time to time, so that users are in a way obliged to regularly buy newer versions. Free bug corrections are pretty rare, and usually limited to critical situations: proprietary software producers prefer to wait for improvements to be sufficient to support the release of a new versions, i.e. an extra price. On the contrary, open-source software is very regularly delivered to users through the release of successive versions which add new functionalities and correct bugs and add minor improvements. As a consequence, open-source software is also "continuously" more efficient than proprietary software.
3. Finally, the performance of a proprietary technology depends of R&D investments by its producer. These efforts tends to diminish for a monopolist i.e. when network effects drive adoption toward a proprietary standard. More generally, business-firms face a trade-off between investments and profits which has an impact on which share of extra earnings associated with increasing returns of adoption is dedicated to further R &D investments and improvements of their technology. On the contrary, open-source communities make no profits, while developers contribute for free.

Open Source development tends to attract numerous (very) skilled workers which prefer open organizational consequence, more developers will generally contribute to a piece of open-source software than to a piece of proprietary software than to a piece of proprietary software for a given level of adoption.

The practice and encouragement of the development of open source will drastically reduce the problems of piracy. The cost of software (proprietary) license is so high that it is unaffordable by most residents of the developing countries thereby leaving them to the criminal option of illegal duplication and distribution of software.

For those in academic community, the open philosophy of FOSS is consistent with academic freedom and the open dissemination of knowledge and information common in academia.

Developing the relevant skills in Open Source alternatives: the challenges ahead in most production environment, particularly in the academic community, Open Source is being encouraged more power the back end servers.

The Nigeria Information Technology Development Agency (NITDA) has identified three main FOSS development tools:

* **Linux (Operating systems)**
* **MySQL (DBMS)**
* **PHP (Front-End Scripting tool).**

Most other FOSS tools centre around the above three tools, particularly Linux.

**Building relevant skill in FOSS** entails: Human capacity building: investigating FOSS communities as informal skills development environments, with economic value for employment generation.

**Software development:** Taking active interest in software engineering to solve most tasks around us.

**Government policy:** what policies and behaviour do governments in the country adopt towards FOSS, open standards and interoperability?

Training and Workshops for further building of skill and collaboration.

In furtherance to this and in addition to the policy thrust of NITDA on Open source is the following:

* Funding of workshop at each of the FOSS participating institutions to further sensitize the universities of the need for alternative software tools such as FOSS;
* Development of guidelines and incentive for sustainable application of FOSS in software development to assure that local content is built into the Nigerian software market.

**The OSS Business Model**

It is now clear that there are (at least) two discrete models for organizing the production of software. Both appear to be sustainable, although along different tracks. While a number of promising business, models have been developed by companies in the open source market place, only very few have been able to realize economic success compared to that seen in the proprietary software sector. Overall, the impact on the software industry and the effects on software innovation of open source are still unclear. With the growing popularity of open source software, a paradigm shift in how the ICT industry makes money is emerging, away from the traditional model based on protection of intellectual property (IP) rights towards a value-added services model (CATIA, 2003). Many open source companies generate revenue from providing ancillary services such as support or training. Cygnus Solutions (CATIA, 2003), for example is a large US company providing support services for widely used OSS applications such as the GCC compiler, which bases its business model on providing high quality technical support to a critical mass of clients.

Recently some high profile open source companies have adopted hybrid or dual licensing schemes, whereby the copyright holders sell the software under a proprietary license as well as continue development under an open source license. Examples are SUN Microsystems Star Office, which is based on the same source code as OpenOffice or the popular open source database MySQL, which is available both under GPL and proprietary licensing terms. Other examples can be found in the scientific sector, such as OSS companies that sell their software, often for a hefty fee, to biotechnology companies and for a reduced fee to universities for non commercial use, and yet still makes the source code publicly available (CATIA, 2003).

Another common concern with open source is how best to leverage advantage. It seems difficult for most organizations to understand how to leverage open-source projects to their advantage. However, the open-source phenomenon poses organizations with a dilemma: By giving away one's intellectual property (the source code in this case).

**The End-user Perspective**

Cost saving is often the first argument brought forward by supporters of open source solutions. In Africa, many organizations are struggling with the substantial upfront acquisition costs for software licenses, but donations and price reductions (especially for schools and community based organizations) often help solve this problem. Although, this itself has created a new set of problems between the software donors and its recipients, such as that contained in an exchange of letters reproduced in Grimshaw (2004) between Microsoft (South and East Africa) and School Net in Namibia. One question is whether potentially higher (intangible) costs for technical support and services for open source software could offset savings on software licenses. To answer this, Total Cost of Ownership (TCO) calculations are used, which attempt to measure the real cost of deploying and using ICT over its lifetime, by looking at all the extra and often unconsidered costs with impact on it. TCO calculations should include an analysis of the risks involved in software deployment. For proprietary software, this may include the risks of price rises in licensing and lock-in to one particular vendor. For OSS, risks may include unexpected interoperability issues with proprietary desktop software and a lack of experienced support staff. According to many TCO studies, initial set-up costs make up only a fraction of product lifetime costs over 3-5 years and the costs of labor for implementation and support often outweighs initial purchase costs. However, most of these TCO studies were conducted in the computing environment in the developed world and are not directly applicable to Africa. Reasons include that the cost ratios of labor, software/hardware acquisition and maintenance may differ significantly in developing countries, where cost of labor tends to be lower. In addition, tariffs and taxes might increase equipment prices, and initial purchasing price factors features more prominently. Both proprietary vendors and independent agencies have carried out various TCO studies. It should however be noted that at present it seems that there is no standardized methodology for determining TCO (Grimshaw, 2004).

In the economies of the North, where labour costs are high the costs of software support, customization and integration are high (reflecting the labour intensity of these components) relative to the license fee for software. Therefore, when the total cost of ownership (TCO) is calculated the cost of the license fee is not a crucial component. However, in developing countries, where labour costs are low the cost of the software license becomes a relatively more important cost component. Figures for piracy from the Business Software Alliance show that there is a correlation between the piracy rate and the effective software license fee (Grimshaw, 2004).

Computer users have had to upgrade their PCs every two or three years, because the operating system is constantly being upgraded and their old PC would not work properly with the new software. However, the home PC user does not require high-end computer systems. Linux and other open source software are a natural response to the monopoly of basic commercial software. Software that is used in specific areas and, therefore, has fewer users, could have a higher price, but basic software such as operating system and office productivity tools, which are installed on every computer system, should be sold at a reasonable price so that everyone can afford them.

With increased emphasis on and pursuit of intellectual property rights enforcement at the international level, the choices available to software users are becoming more distinct. As countries are being discouraged from software piracy toward more strict compliance with standard intellectual property rules, these forces real choices. OSS represents an alternative to having to comply with proprietary intellectual property regulations and users can exercise greater choice on the way their computer systems are implemented and maintained.

**The Software Developers Perspective**

Unlike physical goods, software is not sold outright. Instead, it is licensed to users with the copyright holders retaining ownership of their software. Licensees gain the right to use the software subject to certain conditions. Both open source and proprietary software follow this model, with the kind of restraints placed on users distinguishing the two forms of software. One of the most frequently used open-source licenses: the GNU GPL is by the Free Software Foundation and is a means of promoting open-source at the expense of proprietary software. If a program is distributed under the GPL, all source code must be made available, free. The GPL also stipulates that any user can modify and distribute the program, either in original or modified form. Any redistribution, though, (whether of the original or modified program) must also come under the GPL. This condition has earned the GPL the label of “viral” because it typically means that once code is licensed under the GPL, any other program that incorporates that code falls under the GPL as well.

Training, or for complementary proprietary programs that run with or on the open-source program.

The licensing provisions clearly have implications for firms hoping to earn a sustainable return on software production. Some proprietary software firms specializing in open-source software distributions have attempted to distinguish themselves through the skill of their employees and the level of service offered by their support staffs, enabling them to charge recurrent subscriber support fees. Others offer more complicated open-source products that package multiple open-source programs together, such as a complete Linux operating system distribution, along with an easy installation program. These companies can charge for the convenience of their package, but of course, other open-source providers could easily replicate that package and lower the price. Another route taken by proprietary software firms involves combining proprietary software with open-source programs, allowing the company to charge higher licensing fees for the closed software. Regardless of the specifics, the underlying economics imply that pure open-source software production cannot generate sustainable profits, which is an important point to bear in mind when considering the arguments for governments to use open-source as a development tool (Debroy & Morris, 2004).

Open-source advocates often point to IBM as the epitome of a profitable firm with open source offerings. In 2001, IBM spent $1 billion (USD) backing Linux (Debroy & Morris, 2004). In 2002, it announced that it had recouped this investment in full. Certainly, IBM’s highly visible support of open-source software has been profitable for the company. IBM is not, however, primarily a software company. It is a services and hardware company that has successfully deployed Linux as a means to sell its services and hardware as well as its proprietary (not open source) software. Thus, IBM’s experience does not provide developing nations with a road map to large financial rewards via open-source software. To even attempt this route to economic growth, countries would first need to foster a high tech hardware industry, along with a services and proprietary software industry.

The claim that OSS will create value in developing economies rests partly on the assumption that individual software developers will not only be willing but will be positively attracted to working on OSS systems. There are some debates on this issue that question the attractiveness of working on OSS from an individual’s point of view. A workshop held in March 2004 in Namibia (Grimshaw, 2004) explored these issues, including some face-to-face interviews with participants. The major barriers identified were prohibitive cost of computers and the prohibitive cost of Internet connectivity. In addition, the low cost of labour in the economies means that computers are not immediately employed as a way of improving productivity. In addition, African developers tend to be physically isolated with just a few in each city in each country (although this might not be a problem if there were fast Internet connectivity). The income from programming is sporadic and therefore unlikely to be able to support those with family responsibilities. Governments and other employees fail to look for locally produced solutions, lack of appreciation of the multiplier effects that the ICT sector can have on the economy and, theft of ideas being a problem for OSS developers (code may be open and shared and this means there is no barrier to another person copying the code and then closing it via intellectual property law). The GPL provisions were intentionally aimed at preventing open-source code from being incorporated into proprietary code. One result of the source code distribution requirements is that programmers can charge no more for programs than the cost of reproduction (which are typically quite small). If a programmer tried to charge license fees substantially above the reproduction costs for GPL software, anyone else could acquire the source code and redistribute it on their own, driving the price back down to reproduction costs. With license fees thus foreclosed, the only profit opportunities remaining are for additional services, such as software support or training, or for complementary proprietary programs that run with or on the open-source program.

**Role of Government in Developing Open Source Software**

A number of developing country governments are embracing open source software with an eye toward bringing wide benefits to the economy and society. In some cases, this is motivated by a patriotic desire to support local ICT business and break the power a foreign monopoly has on their ICT sector. For example, the Chinese Government is said to be supporting an initiative to develop their own OSS operating system (Red Flag Linux?), to break the monopoly Microsoft has on their desktop market. Despite generous donations from Microsoft to the Chinese ICT sector, China has decided that the development of a local ICT business based on open systems is a priority.

It is common to have people refer to the Indian software industry and many people think the Indian software industry is successful. The Indian software industry is mainly outsourced work from other countries (Wuqiang, 2003). However, India, which is largely a Microsoft environment, is also adopting OSS because with limited funds to support ICT development, they do not want to become vulnerable to sudden, uncontrollable changes in pricing by being tied to one vendor. In addition, there is the need for Indian scientist and engineers to have the technical knowledge to develop and maintain their own systems without being dependent on any vendor (Sharma, 2004). China and Peru have also raised security and transparency issues as arguments for open source deployment, as they can exert control over the use of open source encryption methods. In the case of countries saddled with large foreign debt payments, such as Argentina, policies that favor OSS have been adopted because of expected cost savings.

Economic growth and development is often an elusive goal. Thus, when a new source of economic development is offered, it attracts attention. In recent years, several policy advisors have offered OSS as a source of economic growth and development. Many developing countries are grappling with what the appropriate level of open-source and proprietary software coexistence should be for a developing economy. Open-source advocates argue that government supported open-source programs can be an important aspect of an economic development program because they can aid nations in creating a local software industry. Since open-source requires so little in the way of initial investments (that is, there are often no up-front licensing fees), proponents claim that the software model’s promise is welcome news for resource constrained developing nations seeking an entrée into the technology and computing sector. One of the more qualitative arguments made regarding developing nations is based on the belief that these countries are fundamentally different than economically developed countries and, as such, that they have a “moral” right to adopt different policies. This argument frequently appears in debates over intellectual property rights, a policy area that goes hand-in-hand with knowledge-based products like software. During the 1800s, for instance, the United States took such a stance in an effort to boost local writers and publishers and refused to acknowledge foreign authors’ copyrights (Debroy & Morris, 2004). Present day arguments run along similar lines: local computer users cannot afford expensive licenses and thus local governments should not have to enforce piracy rules. However, the main question that demands an answer is whether open-source software has the ability to promote economic growth?

The case for open-source software as a growth and development tool has been described as being weak (Debroy & Morris, 2004).

It has been proposed that the arguments muddle reasons for using the software with reasons the software might promote economic growth. The low initial cost of open-source software, the freedom it affords from Western-based companies and the opportunities it can provide for local programmers may well be valid points, but none of them speaks of the ability of open-source to spur economic growth or even to its ability to establish a viable local software industry. The most prominent example in the developing world of a newly emergent software industry is India, and this was without any open-source contributions. The rapid growth of India’s software exports, which comprise 70% of its software industry, is due to its comparative advantage in labor. India has a large reserve of well-qualified, English speaking engineers and technicians that it has parlayed into outsourced proprietary software production for mostly Western clients. These particular circumstances raise the question of whether India’s experience can be replicated among other developing countries (Debroy & Morris, 2004).

**Challenge of Open Source Software Development in Nigeria**

Open Source Software (OSS) has played very important roles in the growth of software technologies. Nigeria being a developing country that faces various socio-economic challenges; access to freely distributed solutions that have no restriction on selling the software as a component of an aggregated solution is invaluable. Using OSS generally helps in saving cost, notably as a result of reduced development time and other expenses. More so, OSS licenses allow modification of the original source code; enabling developers to customize these solutions to suite their particular requirements. It should be noted, though, to avoid misinformation that users of OSS may be restricted from distributing the software in modified form, except as patches included in the original distribution. In Nigeria, the initiative is being challenged by various factors; from both the consuming and producing ends. The volume of OSS being distributed around the world is so enormous that it would be tasking to choose from this array of solutions, particularly without a well informed medium that provides the user community with guided information about the software and respective evaluations. Coupling this with the presumption of inferiority for indigenous products make the idea of local OSS not very attractive. The reliability that has been garnered by proprietary software corporations from the western world over time is overwhelming and would hardly give local OSS developers the chance of expression. It has also built a formidable courtship between our market and these foreign vendors. Really, critical businesses need critical solutions and reasonably, we cannot blame those who turn to the westerners for such.

This does not apply to the case of OSS only. And unfortunately, we are yet to have that very strong voice that would pierce through software consumers heart that a world class solution can emerge from our local community. The idea is not to compete with our foreign counterparts, even if we had to – we first, must have products that can convincingly compete globally. Building applications for the world is different from building applications that sell. A lot of passion is required to have a product that would win millions of hearts around the world. Our current system does not really provide the needed support and platform to enhance this thinking. Software development business is about making profits, and companies invest a lot in the protection of their key ideas and business logics. To create a solution that is distributed freely and can be modified and integrated into other systems would not be a saleable idea. Our economic situation would not encourage developers to conceive and invest in ideas that might not guarantee some level of profit. Really, the foremost software development companies in Nigeria who has some of the best of Nigerian programmers on their payroll may not buy the OSS idea. They are able to pay their employees through proprietary software sales, in the first place. Smaller organizations, freelancers and young talents that could attempt to make some difference in our open source community are facing enormous challenges in getting a standard source of comfortable livelihood. Power supply is critical and other development enabling infrastructures are either poor or unavailable. Developing an application that would compete on the global scene might be too expensive for our folks in this class, and when they are able and come up with something tangible â€“ they surely hope it is their golden pathway to fortune. OSS model would be some risk that they may not be very comfortable of taking. Collaboration has not started working properly in our software development society.

The main idea behind OSS is to create a platform where ideas and knowledge are shared productively, hence creating a broader base for development and innovations. It is still rooted in our attitude to maintain total ownership and control over whatever is ours. Sharing our original ideas such that others can contribute to it and thus be a part of its improved version is a thinking that is naturally alien to us. We need a system that would facilitate open sharing of ideas and collaboration where innovations are supported, nurtured and protected. The only way we can come about this is if we believed that we should be proud of advances made in our local software terrain, whether little or massive. We need a true beginning.  
**THE FUTURE OF SOFTWARE DEVELOPMENT IN NIGERIA**

The Cloud has been identified and indeed become the latest strategic roadmap for ICT development at all levels of engagement. As the Internet continues to transform our lives and by extension, the dynamics of national development and the global economy, conventional wisdom dictates that we must ponder and find new medium and model of constructive engagement. Advances in Information and Communications Technology continue to determine and reshape the way we live, work and play. In particular, is has greatly influenced and positively disrupted the existing model for distribution of political power and national resources. Also, it has and continues to transform the social media, government, education, culture and the way we work Software is at the centre of the current ICT and Knowledge revolution. Convinced that the critical mass of the emerging information society resides in Software know-how, the Institute of Software Practitioners of Nigeria (ISPON) organised the second International Software Conference and Competition at the Tinapa Knowledge City, Calabar, Cross River State between 28th and 30th of October, 2012. About 19 Universities and Polytechnics participated in the National Software Competition segment, out of the 30 Registered and accredited Software Clubs in Tertiary Institutions. The mission is to explore the challenges, impact and opportunities of Cloud Computing and establish a functional roadmap for enhancing its benefits and the survivability and future of Software Nigeria.The Theme of the Conference is “The Cloud and the future of Software Nigeria“ focused primarily to create national awareness on the present and future challenges, opportunities, benefits and risks of cloud computing and help connect government, education and business entities for accelerated action – aimed at improving global competitiveness. The cloud has indeed become a compelling adventure and good news for start-ups and small business, particularly business in developing countries.

Furthermore, the digital business culture now known as cloud economy is fast becoming a reality and future generations will experience its awesome power, when the emerging design and architecture of our planetary digital spider-web is complete and the interfacing links to universal inter-cloud of planetary information system is complete.

In furtherance of the objectives and mission to enthrone National Software therefore, experts converged to explore and critically examine the structural impact of this digital cultural shift and how to engage its opportunities, benefits and risks to the nation, our industry, professions and collective interests. New ideas, opinions and experiences can now be shared quickly and easily in these new forms of communication, technology, new products and market spring up almost overnight – spinning the world around us in nanoseconds. The cloud economy is rooted in patterns of interaction borrowed from social networks and cloud computing, where the real and virtual business worlds mix and complement each other.

In pursuance of the above mission the above, the Institute of Software Practitioners of Nigeria (ISPON) and Government of Cross River State of Nigeria – in collaboration with the National Information Technology Development Agency (NITDA) and Nigeria Computer Society (NCS) hosted an International Software Conference and Competition in Tinapa, Calabar, Cross River State, Nigeria. After numerous expert paper presentations, contributions, deliberations and proof of concept submissions, by International Resource faculties, the following resolutions were agreed as guidelines and strategies for actualizing the next steps:

1.That there is need to proactively launch a national consciousness awareness initiative on cloud computing as a new and revolutionary concept in Information Technology which, if intelligently applied with strategic vision, is capable of taking Nigeria to its pride of place among the global knowledge giants in the technology ecosystem.

2. Government is called upon to establish a national Cloud Strategic Framework, ensuring that the pursuit of Cloud Computing initiative is classified as a significant national ICT asset and project that will guarantee the survivability of the Nigerian nation and make her globally competitive.

3. Experts identified and emphasized several challenges, opportunities, risks and benefits in cloud computing that will significantly impact on the operations of government, its services to the citizenry, regulatory bodies, businesses, Software practitioners, Education sector, the young population and generate an overall effect on the Nigerian Economy in the very near future.

4. Stakeholders identified that Could Computing will grossly impact on education and advised on the strategic importance of reviewing ICT Curriculum at all levels and organizing special certification training for ICT Lectures and Teachers and support services at all level in the Education sector.

5. Government is advised and severally encouraged to facilitate the building of massive ICT Knowledge capacities and capabilities and explore the windows of opportunities presented by Cloud Computing, ensuring that Nigeria leverages on Cloud Computing Infrastructure as a service(iaas), Platform as a service(paas) and also, Software as a service(saas). In particular, Software developers should focus on the Mobile-web market.

6. Experts particularly noted that Cloud Computing offers great opportunity to Software entrepreneurs because it is easy to scale, it does not require investment in massive infrastructure, it offers a global market reach great opportunity for the youths and young population of Nigeria to become entrepreneurs and leverage the global opportunity it offers, emulating examples like founders of Facebook, Google, Instagram. There is need therefore to establish Software Knowledge Parks and Entrepreneur Incubation Centres in strategic locations in the country.

7. The future of and opportunities in the Entertainment Industry – with particular reference to the Film and New Multimedia sector – has a very huge potential for Nigeria. In this regard, Stakeholders recognized and unanimously agree that Software and Local Content should constitute a strategic part of the emerging entertainment and Film industry such as Nollywood.

8. All States of the Federal Republic of Nigeria should be encouraged to establish a State Framework for Cloud computing to ensure the democratisation of tools and knowledge and enable everyone to have easy access and right to knowledge and expertise needed.

9. The conference identified major benefactors in the cloud computing business enterprise as Platform owners, Service Implementers or Sustainers and the Content creators. Experts therefore advice that if Nigeria really wants to benefit from the cloud services they should strategically consider where they want to play either as services providers, Implementers or content creators levels. In this regards, the Nigeria Software industry was encouraged to study carefully the new model that cloud computing offers and leverage the opportunities in the 21st century.

10. Some of the challenges and concerns of Cloud Computing in Nigeria include but not limited to: ownership and security of data and information on the cloud, Policy implications arising from implementing cloud services, Litigations on Data ownership in the cloud and infringement rights, Interoperability and International Legislation.

11. The IT Experts, Community and Stakeholders called on government through Technology Implementing organs such as NITDA and Communication Technology Ministry, and regulatory bodies (CPN) at the conference agreed that the existing policy regimes may be incapable of resolving the imperatives for cloud computing and should therefore be carefully re-considered, reviewed and adopt the best functional and effective, practical and sustainable solutions for implementation.

12. Good infrastructure, Access and availability of broadband to all, access to computer, Education of the youths in the area of software development and the reflection of educational and academic curriculum to reflect practical software development skills are major requirements and critical drivers of cloud computing and its future in Nigeria.

13. The Conference commended the initiatives of the Minister of Communication Technology on the computer-in-school ownership scheme launched by the FG, the proposed connectivity of the Nigerian universities and Research centres to Research Education Network(NREN) and the building of Technology Incubation Hubs in all the geo political zones of the country as some of the ministries initiatives that will drive cloud computing in Nigeria.

14. The hosting and pioneer status for Software Conference and Competition Development in Nigeria by the Government of Cross River State was highly commended. Stakeholders encouraged other states to emulate Cross River State on the cloud services as critical imperatives which was show cased at the launch of the Tinapa Knowledge City, a cluster for knowledge based activities – incorporating E-library, Data Centres, Small business incubation centres, Software incubation and development Centre, as well as Distance and e- learning Centres

15. Finally Experts agreed that the future of Software Nigeria and the implementation of Cloud services in Nigeria lie in the young Nigerian population who should be encouraged to embrace cloud computing at early stage of their life and become the nation’s code warriors.

**Conclusion and Recommendation**

Decreasing worldwide telecommunications costs and software’s inherent portability make software creation a natural candidate for outsourcing to developing countries with a capable supply of software developers. In fact, this is how India began its local software industry by shipping English-speaking engineers for short-term outsourced engagements abroad. While developing nations’ interest in open-source is understandable, given its low investment costs and the overall appeal of software, the open-source model on its own does not appear to provide a solid foundation for profitable business operations that can meaningfully contribute to a nations’ economic growth.

Governments supporting open source software at the expense of proprietary software will not aid the creation of this kind of growth and may even hinder its development. While the interest of developing nations in open source is understandable, given its low investment costs and the overall appeal of software as a source of revenue, the open source model on its own does not appear to provide a solid foundation for profitable business operations that can meaningfully contribute to a nations’ economic growth.

It is therefore recommended that while Nigeria as a country can adopt Open source technology as a low cost option that will allow Nigerians have access to essential software tools (especially operating system software like Linux, software development tools and Office productivity software) needed to build up the countries ICT capacity, government should assist with Open source Research and Development, Education and Training efforts, and allow Open source software solutions to compete with proprietary options during software acquisition and procurement processes.

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