

Revolutionizing Information Technology Success Using Green computing

H.Y. Raji-Lawal¹, A.O. Adesina & O.C. Akerele

Lagos State University,
Ojo, Lagos, Nigeria

halaw313@yahoo.com, inadesina@gmail.com, ocakerele@yahoo.com

ABSTRACT

Green computing is the study of efficient and eco-friendly computing resources. It is about reducing, reusing and recycling. It is under the attention of environmental organizations, and businesses from other industries. The full potential of these changes are continuously evolving making information technology a major influence of Green computing towards a safer environment. For the purpose of this research a survey was carried out to study the level of awareness of people about green computing, and how information technology trends has affected the concept. To carry out these a computerised questionnaire was designed, and Computer Science Students of Lagos State University were used to administer the questionnaire. To further highlight this, a simulation of account notification and online recharge software was built. The research conducted analysis on the awareness of respondents of their environment, and the need to keep it from atmospheric hazards. Also, analyses were conducted to know respondent's view on e-banking, and their willingness to support green computing. This thus reveals how information technology has improved the environment based on the revolving technological trends. The result shows that the level of awareness of green computing is as high as 80%.

Keywords: Going green, Green IT, Sustainable environment

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1. INTRODUCTION

Information technology is described as a technology which uses computers to gather, process, store, protect, and transfer information. It is the widespread access to, sharing of, and use of information through technology. Information technology is highly facilitated by the "Internet". (Lawrence Lau 2010). Information Technology has been developed over the years. Despite the years, there are several questions unanswered, like "have we looked in to the effects of the tremendous trends?" "Do we know they can affect the environment?" "The effects these accomplishments have on our eco-system?" . The air we breathe, the food we eat and the water we drink are all contaminated with pollutants, which are acting back upon us and harming us. Newton's third law of motion states that "For every action, there is an equal and opposite reaction.", therefore, consumption of energy sources has a negative reaction on our environment. We hear the phrase "going green" but do we actually know what it means? The concept of green computing revolves around making sure that people are practicing how they can save resources when they use the computing technology. Basically it is the remodeling of Information Technological products. It makes less use of computers, produces and energy. Green Computing is a type of approach that deals with awareness about the harmful impacts of the use of computer and IT products on environment.

One of the first results of green computing was the sleep mode of computer monitors which places a consumer's electronic device on standby mode, when a pre-set period of time passes, and user's activity is not detected. It is impossible to read a newspaper, magazine, or Web page without hearing about the impact of information technology on our society. Information is travelling faster and being shared by more individuals than ever before. Thus, the aim of this research is to research on the influence of revolution of IT on green computing, using E-banking as a case study.

2. LITERATURE REVIEW

Information technology has always been at the centre of human growth and development. From the earliest times, humans have had to deal with the problem of gathering, processing, storage, and usage of information. These activities have remained a central part of human society up to the current time and will continue to do so. As information spread throughout the world and advances were made to information technology that reduced the cost of information and its distribution. It was seen that individual growth and development was conducive to the advancement of the society itself (John M. Mason, 2005). The new important issues for enterprises, governments and societies are to care about environmental issues and to adopt environmentally friendly practices.

Information Communication Technology (ICT) is a good way to reach this outcome because it improves our overall energy productivity while maintaining a high quality of life and dynamic economy. Information technology (IT) provides many benefits to the society. First of all, it decreases the energy needed to design, manufacture and distribute the IT devices and equipment. Secondly, it increases the operating efficiency of the IT technologies when installed and online. ICT has a key role in terms of driving innovation productivity and growth in organizations and how people work, live and interact, so IT sector continues to grow and is predicted to comprise 8.7% of global GDP (Gross Domestic Product) by 2020 (The climate group, 2008). The success of green computing using information technology cannot be under estimated. It's significance is noticed in the following areas:

E-learning: Through the widespread of information technology, education via the Internet, network, or standalone computer has been introduced, this has reduced combustion in the atmosphere, you can seat in the comfort of your home and increase your knowledge (Vangie Beal 2014). E-learning methods have drastically changed the educational environment and also reduced the use of papers and ultimately reduce the production of carbon footprint (Mahalakshmi, R. *et al*, 2013).

E-government: It essentially refers to "the utilization of Information Technology (IT), Information and Communication Technologies (ICT s), and other web-based telecommunication technologies to improve and/or enhance on the efficiency and effectiveness of service delivery in the public sector. (Mabel Trevor 2005). E-government as a tool of information technology has contributed to the

success of green computing by creating a common ground with the government and the people.

Online banking: is an electronic payment system that enables customers of a financial institution to conduct financial transactions on a website operated by the institution, such as a retail bank, virtual bank, credit union or building society. In the actual sense households are long enough to stretch around the globe two hundred times. If these households opts for on-line banking, the following are achieved:

1. It reduces as much green-house gas as removing 355,000 cars from the road
2. It saves enough energy to supply electricity to all San Francisco homes for one year
3. It eliminates enough solid waste to fill 56,000 garbage trucks.

The use of electronic statement and debit cards in on-line banking conserve paper and saves time. Online banking saves trees, there had been a reduction of resources required to make, ship and ultimately discard paper, Javelin(2007). For instance, 53 percent of all U.S. households (61 million) now do their banking online; nearly half of those also pay their bills via computer. Whopping 16.5 million trees, roughly 2.3 million tons of wood, could be spared annually in the unlikely event that all U.S. households made the switch to paperless payments. Such a move would also reduce fuel consumption by 26 million BTUs (Tan, M. *et al*, 2013). Figure 1 depict a typical architecture of account notification in a banking sector. It is made up of the configuration of the system that has to do with updating and querying account.

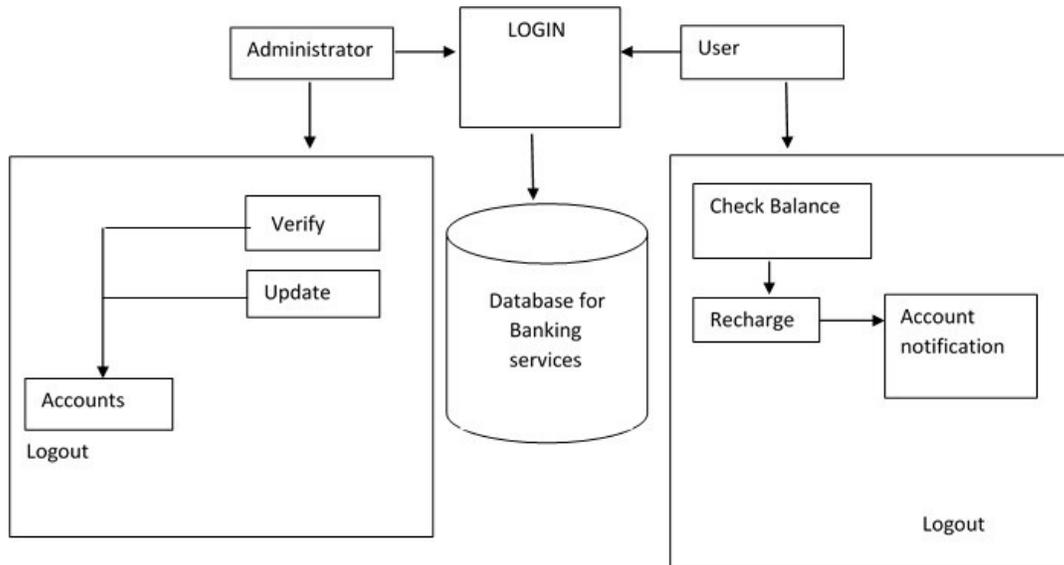


Figure 1: Architecture of simulation of account notification and other banking services.

Online shopping/E-commerce: A form of electronic commerce which allows consumers to directly buy goods or services from a seller over the Internet using a web browser. Shopping over the web generates fewer carbon emissions than buying items at a shop, according to research. A report, published by the logistics research center at Heriot-Watt University, claims that buying online generates “significantly less” carbon dioxide than the average trip by car to purchase items such as CDs, books, cameras and household goods (Simon Williams 2009).

Email: is a method of exchanging digital messages from an author to one or more recipients. Modern email operates across the Internet or other computer networks. Some early email systems required the author and the recipient to both be online at the same time, in common with instant messaging. Today's email systems are based on a store-and-forward model (John Rhoton 2000). With email, people and businesses no longer have to send postal mail to relay information. Instead, users can write a simple message and send it instantly. This there by reduces foot print on the atmosphere.

2.2 Definition of existing and new system

This study looked into online recharge as a branch of online banking, it is one of the innovations of information technology which influenced green computing. Figure 2 shows the flow of data in an on-line recharge system. It illustrate the process of validating user's account, and querying the user's detail before executing the on-line recharge process. Before the development of the new system, there had been a system which was employed by mobile phone users to recharge their devices. This system involves manual use of paper recharge cards from local vendors. The new system will be investigated, using a simulation of account notification and online recharge to highlight and enumerate the benefits of the new system and the limitations of the old system.

2.2.1 Advantages of the new system

1. This system will support a reduction in the use of paper in telecommunication companies and banks thereby saving stress and creating a greener atmosphere.
2. Combustion and emission of toxic CO₂ is reduced in the atmosphere, as more people do not have to go out to get check account balance in banks or scout for recharge vouchers.
3. It can be accessed virtually anytime and anywhere.

2.2.2 Flow of data in simulation of on-line recharge system

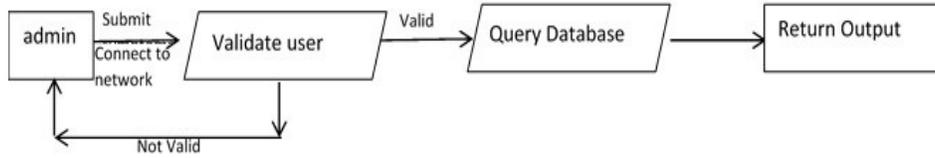


Figure 2: Dataflow diagram for simulation of online recharge system.

3. RESEARCH METHODOLOGY

A web based questionnaire was designed to sample individual’s opinion within the university community of Lagos State University, Ojo. The set of questions were placed on the web to know how aware people are of green computing, and the impacts of IT trends to the environment. A simulation of account notification for online recharge was built as a case study. To analyse information technology trends and how it has affected green computing a Survey research design was employed in carrying out the expected and required manner to gather data. To carry out this a computer based questionnaire was used. A sample size of ninety (90) students from the Lagos State University was used for the purpose of this study.

3.1. Research Questions

1. There had been a drastic and positive revolution in IT, how has this influenced green computing?
2. Has online banking contributed to the success of making the environment greener?

Figure 2 and 3 depicts the screenshot of the computerised questionnaire:

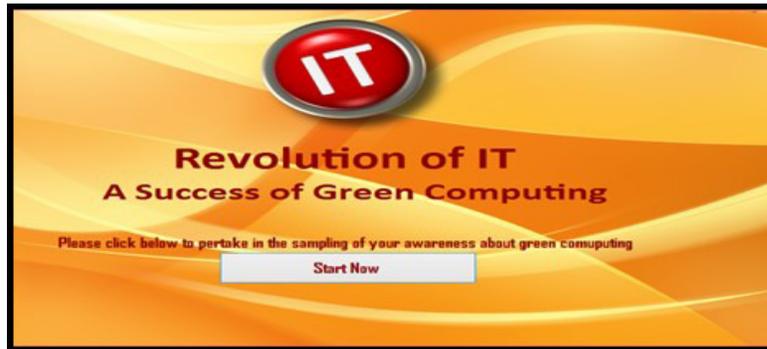


Figure 2: Computerised Questionnaire



Figure 3: Computerised Questionnaire

2.2 Research Model

- H - Hypothesis
- H1 - Influence of swift revolution of IT on the greenness of the environment
- H2A - There is a swift movement of stake holders from paper recharge to on-line recharge, this influenced the greenness of the environment.
- H2B - There is a swift movement of stake holders from traditional banking to on-line banking services, this influenced the greenness of the environment.

Figure 4 is a model of revolution of IT success of green computing, it shows that the swift movement of the technology towards IT has contributed to a greener environment.

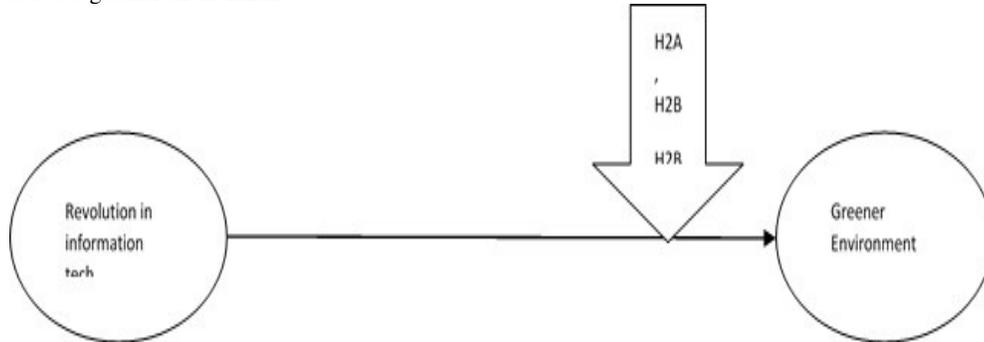


Figure 4: Model of Revolution of IT success of Green Computing

4. SYSTEM IMPLEMENTATION AND RESULT

4.1 Result

To analyse information technology trends and how it has affected green computing a Survey research design was employed in carrying out the expected and required manner to gather data. To carry out this a computerized questionnaire was used. A sample size of ninety (90) students from the Lagos State University was used for the purpose of this study.

Analysis of data collected in these section shows 42.2% of the respondents fall within the age bracket of 18-20, 40% fall within 21-25 and the remaining 17.8% are within the age of 25-30. 45.6% of the respondents are females and the remaining 54.6% are males.

4.1.1. Graphs

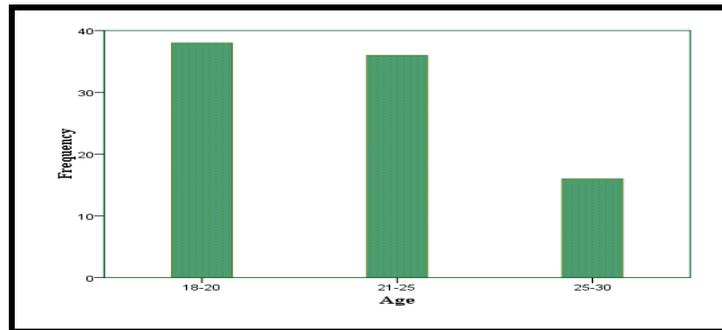


Figure 5: Graph of age of respondents

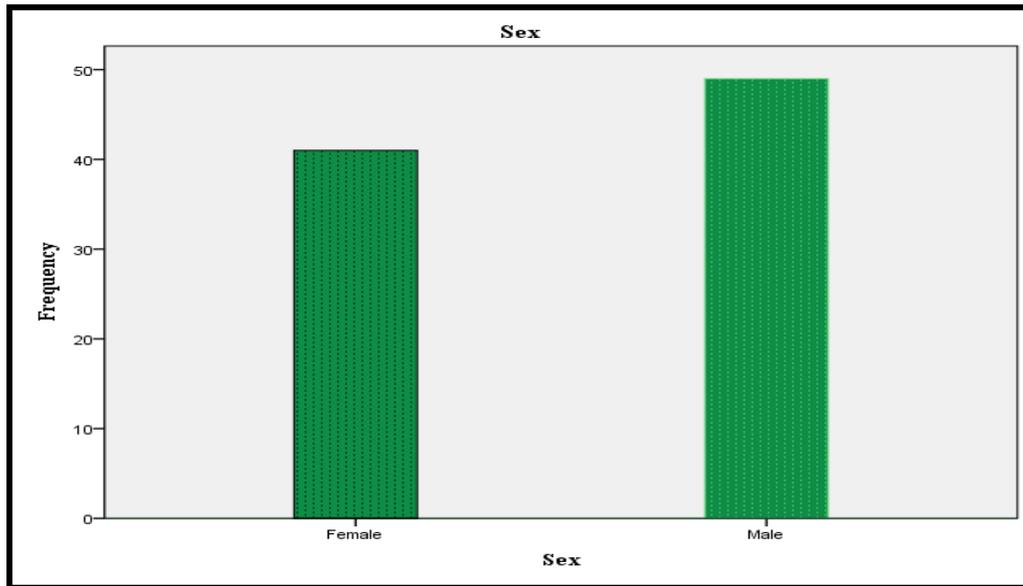


Figure 6: Graph of sex of respondents

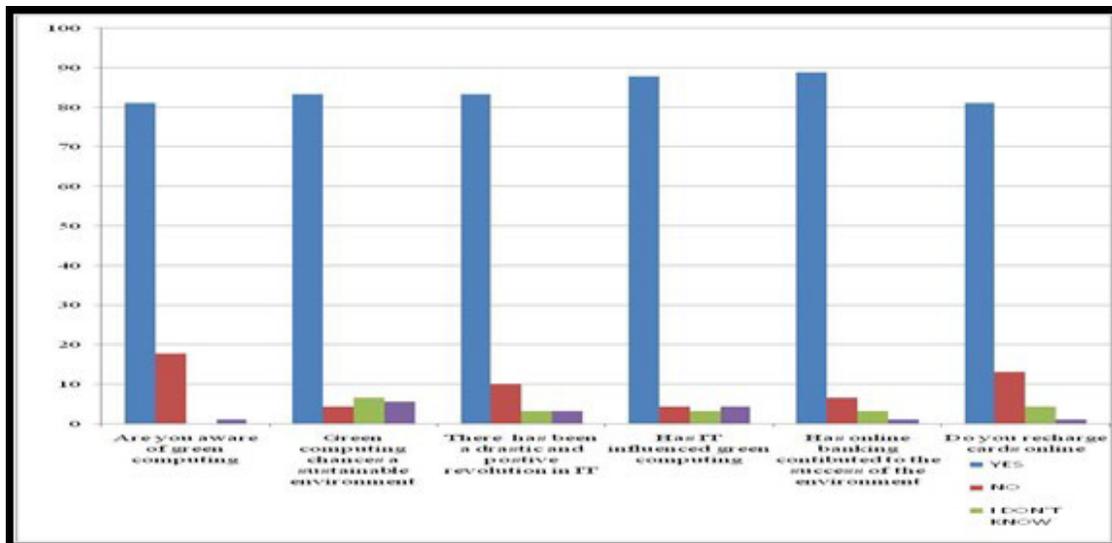


Figure 7: Graph of data

4.2. Data Interpretation

Figure 7 depicts the graphical representation of the analysis of the response of the questionnaire. According to the results generated from the questionnaires using the table 4.1, The following results were drawn from the analysis of respondents on the questionnaire:

Research Question 1: There had been a drastic and positive revolution in IT, how has this influenced green computing?

- Question 7: 78.9% of the 90 respondents agree that IT shortened production cycle and reduced transaction cost
 Question 8: 87.8% of the respondents support the fact that IT influenced green computing in the banking industry
 Question 9: 83.3% of the respondents agreed that there has been a drastic and positive revolution in IT, like from TV broadcast in terms of communication, to table phones to e-technology to mobile technology.

Based on figures generated, indeed there had been a drastic change and positive revolution in IT which has also influenced green computing. Every sphere of our lives have been made easier with information technology innovations. IT has reduced the production cycle and reduced transaction cost of industries, which in turn reduces foot print on earth. Moreover, the percentage of respondent that support this indicates that revolution of IT is a success of green computing.

Research Question 2: Has online banking contributed to the success of making the environment greener?

- Question 14: 88.9% of the respondents agree that online banking contributed to the success of the environment.
 Question 15: 81.1% of the respondents recharge cards online.

According to these figures generated from respondents, a large amount of people are leaning towards online banking. Most IT innovations works towards reducing foot print on the earth, which in turn makes our environment more sustainable. Account notification is a typical case study, which actually reduced the rate at which people move around to keep track of their account.

Table 1: Analysis of Research Questions

H1	H2A	H2B
RQ1 = 81.1%	RQ14 = 81.1%	RQ8 = 87.8%
RQ2= 83.3%	RQ6 = 87.8%	RQ6 = 87.8%
RQ7 = 78.7%	RQ7 = 78.9%	RQ7 = 78.9%
RQ11= 78.9%	RQ12 = 51.1%	RQ15 = 81.1%
RQ13 = 73.3%		
Average = 79.1%	Average =70.4%	Average =83.9%

The average of H2A and H2B are 70.4% and 83.9%, this indicates that online recharge and online banking services have influenced the greenness of the environment positively. Based on this, revolution of IT is a success of green computing.

Table 2: Result of questionnaire

S/N	QUESTIONS	A	B	C	D
1	Are you aware of the term green computing	81.1	17.8	-	1.1
2	Green computing chances a sustainable environment	83.3	4.4	6.7	5.6
3	Do you think energy consumption of computers can affect the ecosystem	87.8	6.7	2.2	3.3
4	Do enterprises that embrace green computing have an edge	76.7	7.8	8.9	5.6
5	Do companies that poorly address the environmental problems make more profit	43.3	50	5.6	1.1
6	Companies can make their services by using telecommuting	87.8	8.9	2.2	1.1
7	Has IT shortened production cycle and reduced transaction cost	78.9	16.7	-	4.4
8	Has IT influenced green computing	87.8	4.4	3.3	4.4
9	There has been a drastic and positive revolution in IT, like from TV broadcast in terms of communication, to table phones to e-technology to mobile technology	83.3	10	3.3	3.3
10	Are you aware of e-commerce	87.8	10	2.2	-
11	Do you support the fact that IT is an improvement in technological trend	78.9	15.6	3.3	2.2
12	Since e-banking reduces the rate of moving around through telecommuting and thus reduces the rate of combustion, can e-banking be likened to green shopping	51.1	28.9	17.8	2.2
13	Do you agree that disconnecting our power consuming devices when not in use can make our buildings green	73.3	11.1	10	5.6
14	Has online banking contributed to the success of the environment	88.9	6.7	3.3	1.1
15	How often do you recharge cards online	81.1	13.1	4.4	1.1
16	Do you support that reducing the consumption of loosely packaged items considerably makes the environment green by reducing no of disposable materials	81.1	7.8	7.8	3.3

A – Yes B – No C – Not sure D – I don't know

5. SUMMARY AND CONCLUSION

This research work shows how information technology trends have influenced green computing. We should understand evolving trend of information technology from the early times of abacus to the information technology age. This project work shows how information technology innovation such as, online banking, online shopping, e-learning, e-government, e-mail, etc, has contributed to achieving a safe and healthy ecosystem. A review of how information technology has helped to reduce combustion in the atmosphere was highlighted amongst other influences such as creating avenue for interaction with the people and the government, reduction in movements of people through telecommuting and improvement in education using studying from home technique. The great impacts of information technology cannot be over emphasized; it has absolutely touched every sphere of our lives, from education, transportation, communication down to businesses. The concept of green computing revolves around making sure that people are practicing how they can save resources when they use the computing technology. Green computing is about reducing, reusing and recycling.

Investment in environmentally sustainable Information technology is the key to future success. A growing number of Information Technology users are moving towards making the atmosphere green and thus assisting in building a green society and economy. Our lives have been made easier with information Technology and our atmosphere will be greener if we support these innovations instead of being stereotypes. However, no one can predict the ever evolving trend of Information Technology, but one fact we should know is it will always get better!

REFERENCES

- [1] Beinhauer, F. (2011). History of Information Technology in the BC Forest Service for Forest Service Centennial, WWW.bcfs100.ca/bcripts/links.asp 15/03/2016.
- [2] Gaurav, J. (2012), International Journal of Emerging Research in Management & Technology, p.4.
- [3] Gleick, J. (2011). The Information: A History, a Theory, a Flood. New York: Pantheon Books, p.6.
- [4] Harris, J. (2014), Green Computing and Green IT Best Practices On Regulations and Industry Initiatives, Virtualization, Power Management, Materials Recycling and Telecommuting, ACM digital library, p.19.
- [5] John, R. (2000), Battle Of the E-mail protocols, Programmers guide to internet mails: SMTP, POP, IMAP, and LDAP-google books, p.4.
- [6] Kevin, K. (2010), Selected maxims, New Rules for the New Economy, New York: Viking, p.16.
- [7] Lawrence, L. (2010), Economic Globalization and the Information Technology Revolution, [web,Stanford.edu/~ijlau.edu/ijlau/presentations/cppcc](http://web.Stanford.edu/~ijlau.edu/ijlau/presentations/cppcc) p.1-16.
- [8] Mabel, T. (2005), Key Issues in E-government Strategy and Management, Key Issues, p.5.
- [9] Mahalakshmi, R., Suresh, E. S. M. (2013), LMS a Tool for Green Computing, Indian journal of research peripex, p.78-80.
- [10] Mason, J.M. (2013), Five Major Trends Connected with Information Technology, WWW.Personal.psu.edu/users/j/m/jmm27/Courses/535/papers/tr-w-it.pdf, 15/03/16, p.1-11.
- [11] The climate group (2008), Smart 2020: Enabling the low carbon economy in the information age, WWW.theclimategroup.org/what-we-do/news-and-blogs/ 05/04/16.
- [12] Ms. Sam IksharavindraSuryaWansi, Ms. Monica Mohan Chavan, Green Computing: An essential trend for secure future, Proceedings of National Conference on Emerging Trends: Innovations and challenges in IT, p.19-25.
- [13] Pardeep, M. (2013), Green Computing – Need and Implementation, International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 2, Issue 3, March 2013, p.26.
- [14] Pikkarainen, T. (2004), Consumer Acceptance of online banking: an extension of the technology acceptance model, Internet Research p.224-235.
- [15] Samiksha, R.S. (2013), Green Computing: An essential trend for secure future, Proceedings of National Conference on Emerging Trends: Innovations and Challenges in IT, p.3.
- [16] Tan, M., Teo, T.S. (2013), Factors Influencing the Adoption of Internet Banking, Journal of The Association For Information System, p.16.
- [17] Useoftechnology.com (2012), Impacts Of Information Technology, <http://useoftechnology.com>, 15/12/16.
- [18] Vangie, B. (2014), Technological Definitions For IT Professionals, http://webopedia.com/TERM/E/e_learning.html, 15/12/16.
- [19] Javelin(2007), Investing in a green feature, WWW.Commoncentsplanning.com/investing-in-a-green-feature.aspx, 06/04/16.