# Need for Information and Communication Technology (ICT) for NPOs

**The Institute of Chartered Accountants of India**
*(Set up by an Act of Parliament)*
**New Delhi**

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# Foreword

Information and Communication Technology (ICT) is principally an umbrella term that encompasses all communication technologies such as internet, cell phones, wireless networks, satellite communications, digital television etc. that offer access to information. In the past few decades, ICT has provided the world with a vast array of new communication capabilities and has fundamentally changed the way we live now.

The Institute of Chartered Accountants of India (ICAI) at its end has been extending a helping hand in the form of publications and training programmes/seminars in the relevant areas to its members to help them with evolving knowledge. This document 'Need for ICT for NPOs' is being brought by the Committee for cooperatives & NPO Sectors of the Institute is a landmark in this direction.

The referred document presents the current status of ICT tools, its usage in NPO sector in India and suggests some of the sectors where ICT can be effectively used in future. It focuses on the use of ICT technologies in Daily Life, Banking, Industry, Commerce, Health and Education. It also provides solutions for better working and way forward. For easy understanding and practical implementation, the document is written in a very lucid and logically flowing manner.

At this juncture, I congratulate CA. Vijay Kumar Garg, Chairman, Committee for Cooperatives & NPO Sectors, CA. V. Murali, Vice Chairman, and all other members for their efforts and contributions to bring out this publication.

I am sure this publication will be useful in developing the NPOs efficiently and effectively and solving issues relating to ICT.

Date: Jan 18, 2012                                                 **CA. Jaydeep Narendra Shah**
Place: Delhi                                                              President, ICAI

# Preface

India has the largest system of NPOs in the world. To introduce ICT-enabled system in NPOs one needs to have high quality multi-media enriched content in different disciplines, including its multilingual conversion, capacity building of stakeholders in ICT skills and state-of-the-art infrastructure along with networking and internet connectivity via Virtual Private Network (VPN) / broadband connectivity for disseminating the content and affordable access devices so that it reaches the doorsteps of the stakeholder.

I am pleased to share with you that Committee for Cooperatives & NPO Sectors of ICAI in its continuous endeavor to help the stakeholders of NPOs with evolving knowledge of the sector by way of publications in the relevant areas, this document ''Need for ICT for NPOs' is one such endeavor in this direction. It focuses on the Use of ICT technologies in Daily Life, Heath, Education, new solutions for better working and way forward.

I would like to take this opportunity to place on record my deep appreciation to Mr. Rajiv Mittal who has prepared the basic draft of this publication.

I compliment the members of Committee for Co-operative & NPO sectors for their valuable suggestions and comments.

I wish to extend my sincere thanks to Dr. Amit Kumar Agrawal, Secretary to the committee, Committee Secretariat and others who were directly or indirectly instrumental in bringing to this document.

I also thank CA. Jaydeep Narendra Shah President, ICAI and CA. Subodh Kumar Agrawal, Vice-President, ICAI for their able guidance.

I am sure that this document 'Harmonizing of Accounting Practices for Cooperatives and NPO Sectors' will be of great help for the reader.

Date: Jan 23, 2012 **CA. Vijay Kumar Garg,**
Place: Delhi Chairman
Committee for Co-operative & NPO sectors (CCONPO)

# Table of Contents

# Chapter 1
## Objective of Research

**Objective:** To find out the current status of ICT tools and their use in NGO sector in India through primary and secondary research and suggest some of the sectors where ICT can be effectively used in future.

**Detailed Objective:** Establish the effectiveness of Indian NGOs with regard to information Communication technology (ICT) usage. Reflect on how NGOs are using ICT in unique ways within development initiatives. Establish whether ICT helps NGOs to make a positive difference in serving their constituencies. Determine if NGOs are being properly served by the ICT industry. Highlight the ICT resources NGOs currently have, and see how they use such resources. Review the expectations NGOs have of these resources and of what benefits they might gain from such resources.

In preface, we talked about how Computers have developed over last century along with mobile and internet the three essential part of ICT. We have also seen how these technologies are used by NGO's in different countries successfully for uplift of social and economical conditions. Now, in order for India to be able to do the same we need to see how much our NGO's and NPO's are aware of these technologies, and how much they are utilizing these technologies, what their current usage is and what their future plan will be. All these views and research will enable us to find out where we are currently so that we can analyze the situation and look for future planning.

Many international organizations have done similar studies in different geographical sectors and the same reference1 is adopted in this research study. This study essentially wants to find out firstly what level of awareness about ICT is there in these sectors as ICT itself has a wide scope and can be useful in different area of education, health, social service, infrastructure, government area, industries, financial services.

NGO's are working in different areas and each area's need is different, yet all these areas have some common requirements in terms of requirement for computers, requirement for internet and requirement in mobile communication as these are the basic building blocks of ICT. So we can study how much our NGO's are equipped with these basic tools

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[1] Worldwide wox, http://labspace.open.ac.uk

Secondly, after knowing about the availability of basic tools we need to look into the knowledge level of the operators of these tools, as these operators' capability will ensure the usage of these tools. Better operators give us better output and only purchase of tools is not sufficient. Their usage awareness is equally important, as the study of awareness level will lead us on to the need of the knowledge and show us the present gap we need to work towards.

Then, thirdly and most importantly, the application and services in which these tools can be utilized to get the maximum output is needed. Now a computer and its operator are of no use if he only knows how to operate windows and has no knowledge of how a Computer can be utilized as a file manager or database system which can eliminate the need of big manual file system and make retrieval of information much easier. Therefore, right applications in the required field is one area of research which guides us towards modernization of these technologies and shows us the future path.

# Chapter 2
# Research Methodology

## Methodology

Independent Researcher conducted interviews in 2012 with 100 ICT and financial decision makers in the NGO sector. These were selected from a broad spectrum of NGOs across India, utilizing 2 (http://ngo.india.gov.in), an online directory of Indian NGOs and development organizations

## Geography

The methodology was based on the sample being nationally representative. The research tried to make the scope wide enough to collect samples from different geographical spread. The geographic spread achieved was 50% nationally based and 50% regional based; as such it was quite even scope-wise distribution of samples. Now when these NGO were checked on the basis of working, whether in cities or villages, the following was our sample rate

67% NGOs work in cities and only 33% among the sample work in villages. The more rural places saw low NGO representation. This reflected lower representation of NGOs in these provinces, as well as the difficulty often encountered in effectively reaching NGOs in these areas.

Program areas: Major program areas are headed by Community Development with 39%, followed by Social Services and Child Welfare.

## Size and scale

We will also look into the size of NGO which is responding and scale of the operation or presence will be taken care of. The following will be considered Number of branches, In terms of infrastructure, size from a branch point of view, consists of single-branch NGOs, two- branch NGOs, less than five-branch NGOs, and more than five-branch NGOs.

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[2] Data from ngo.india.gov.in

# Staff type

We also looked into the different type of employment used by the NGO's and NPO in their daily operation, whether they are permanent staff, temporarily staff or volunteer staff

# Roles of respondents

Now to ensure the feedback quality we have taken in account what is the role of respondent the different categories are

Finance Manager/Administrator

CEO/Manager

Other

ICT Manager

Media and Communications

Fundraiser

Website Manager

# Chapter 3
# Data Collection and Samples

For the Analysis of the current situation of ICT in NGO's and NPO's the data needs to be collected in different ways, two different approaches were used for the data collection purpose.

**Primary Data:**[3] Directly NGO/NPO represented were interviewed and asked the relevant questions and data was collected. For this purpose as described in previous section a group which were either. Finance Manager/ Administrator, CEO/Manager, Other, ICT Manager, Media and Communications, Fundraiser, Website Manager were used.

These are the main persons involved in the daily operations and directly responsible for the working of that particular group. As part of this research we have selected 100 groups in different parts of India, representing different sections and areas of expertise., Although India has more than 3 million NGO's registered in different areas of expertise we tried to cover some of the main areas to keep data uniform across sections.

The primary purpose of data is to provide us with the current situation in these NGO's and thus give us the key data which generate analysis point that will provide us with a roadmap and suggestions which can be used in working to improve the efficiency and replicate the best practices across the globe.

**Secondary Data:**[4] Secondary data was collected for research from different sources to find out how NGO's/NPO's in other countries are utilizing ICT technologies for the betterment of social conditions, child welfare, increasing efficiency in daily operation, for reaching masses through communication methods, best practices. Main sources are internet, research journals, books and discussion with fellow researchers. All this data is compiled and put in such a way that it complements the primary data and suggests us the way forward.

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[3] Special tool was developed to collect data

[4] Sources reference given at end of the paper with internet and journals being main sources

The sequencing of the secondary data is as we have discussed about what ICT is and what are its building blocks, then we will discuss what are all the components and uses in general practices and how ICT is used in different areas to improve the efficiency of that particular sector. Next we will complement it with our primary data to check how exactly our Indian NGO/NPO are placed, then followed by the best practices in different parts of the world, and suggest new solutions for these organizations.

Finally we concentrate on two sectors of education and health with best practices and future of ICT in these sectors.

(a)    First, what is ICT

(b)    Then, uses of ICT

(c)    Analysis of current condition in India

(d)    New solutions for better working

(e)    And then discussion on education and health industry with how ICT can be used in these sectors

# Chapter 4
## QTest-Development and Uses of Research Tool

For primary data. there was need to systematically collect the right data, in right sequence to reach to a reasonable analysis to that end, a research tool "QTest" was developed using Excel software.

First a draft QTest was designed based on the research requirement and then was sent to 7 fellow researchers for their advice and feedback and after 3 revisions the final "Qtest" was selected for this research.

The QTest is based on Excel5 platform, it consists of 2 worksheets where first set of Worksheet contains different questionnaires which are divided into different sections, then the Tool's second worksheet has series of formulas and graphs which automatically produce the analysis. We have discussed this Analysis in detail in the chapters that follow.

Now let's analyze the QTest tool. The methodology of development of tool is to first divide the whole study into different sections of IT, telecommunication services, ICT adaptation, Quality, Cost Technology usage, Coming objectives and finally Conclusion.

Firstly, the Tool collects information in IT usage which will mainly cover how many computers each NGO has, what type of operating system they use, how much networking is in use, what type of office softwares they use etc. Secondly, in Telecommunication Services usage of e-mail, Fax, mobile etc, we will see what level of ICT adaption is done in these NGO's in terms of CRM, accounting and in daily operations, Security measures implemented in network, Internet usage, type of internet etc. Next comes Discussion on Quality in terms of Hardware and software, followed by Cost satisfaction of these hardware and software, then finally what they think of future of ICT in coming years and finally our conclusion of current situation in these organizations.

These data are tabulated in QTest tool, which then picks up these data using formulas to generate analysis graphs in readable form to understand the illustrated points and objectives.

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[5] Excel is a Windows based spreadsheet tool provided by Microsoft

# Chapter 5
## QTest-Tool Testing and Finalizing

The research Tool QTest once developed was sent to 7 experts 6to verify and provide the feedback on this tool.

**Revision[7] 1:** First version of tool has around 70 questionnaires with some questions which experts felt were not in line of study and thus were optimized or replaced with more relevant sections, Also the first version was not fully automated to produce graphs and analysis points which was highlighted by group of panelists and experts and suggestions were given for the same. Other suggestions included were to collect financial parameters and conditions of the NGO's to compare the Financial status versus investment in ICT.

**Revision 2 :** Second revision included the usage of E-mail to collect the data samples other than the manual part, so that more advance NGO's which already are aware of computers can mail there feedback and which can be directly imported into the Qtest tool.

**Revision 3:** Each expert was provided with some samples of data for testing, and based on the same the third version was agreed and used for the final research purpose. The advantage of Qtest is that this tool can be used directly to conduct similar research in future to keep track of future development and reduce time. The other features are E-mail import, database export, and auto-graphical representation.

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[6] Experts in area of ICT, NGO working and independent researchers
[7] Three revions or version were developed before finalization

# Chapter 6
## Secondary Data: Introduction to ICT Technologies

Now the Question is What is ICT? Everybody is talking about ICT, but how is it relevant to a common person and what does it means?, The section below will now tell you what is ICT in a much simpler form.

ICT is an acronym for Information Communications Technology

Now this acronym is the only constant thing about ICT. Due to fast changing technology and scenarios this term keeps changing its meaning and is in a constant process of evolution. That is the beauty of this technology

Basically, the meaning lies in 3 words:

— Information

— Communications

— Technology

Now, what do these three words tell us? Different Technologies which provide any information which is needed by a person, organization, Business or enterprise in order to improve their knowledge or use it for their business purpose or their ease can be considered as ICT.

A good way to think about ICT is to consider all the uses of digital technology that already exist to help individuals, businesses and organizations use information. ICT covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form. For example, personal computers, digital television, email, robots.

So ICT is concerned with the storage, retrieval, manipulation, transmission or receipt of digital data. Importantly, it is also concerned with the way these different uses can work together in tandem.

In business, ICT is often categorized into two broad types of product:

(1)     The traditional computer-based technologies (things you can typically do on a personal computer or using computers at home or at work); and

(2)     The more recent and fast-growing range of digital communication technologies (which allow people and organisations to communicate and share information digitally)

Let's take a brief look at these two categories to demonstrate the kinds of products and ideas that are covered by ICT:

Traditional Computer Based Technologies. These types of ICT include:

1.      Application Use Standard Office Applications - Main Examples

(a)     Word processing e.g. Microsoft Word: Write letters, reports etc

(b)     Spreadsheets e.g. Microsoft Excel; Analyse financial information; calculations; create forecasting models etc

(c)     Database software e.g. Oracle, Microsoft SQL Server, Access; Managing data in many forms from basic lists (e.g. customer contacts through to complex material (e.g. catalogue).

(d)     Presentation software e.g. Microsoft PowerPoint; make presentations, either directly using a computer screen or data projector. Publish in digital format via email or over the Internet.

(e)     Desktop publishing e.g. Adobe Indesign, Quark Express, Microsoft Publisher; produce newsletters, magazines and other complex documents.

(f)     Graphics software e.g. Adobe Photoshop and Illustrator; Macromedia Freehand and Fireworks; create and edit images such as logos, drawings or pictures for use in DTP, web sites or other publications.

2.      Specialist Applications:

(a)     Accounting package e.g. Sage, Oracle: Manage an organisation's accounts including revenues/sales, purchases, bank accounts etc. A wide range of systems are available ranging from basic packages suitable for small businesses through to sophisticated ones aimed at multinational companies.

(b)     Computer Aided Design: Computer Aided Design (CAD) is the use of computers to assist the design process. Specialised CAD programs exist for many types of design: architectural, engineering, electronics, roadways.

(c)     Customer Relations Management (CRM): Software that allows businesses to better understand their customers by collecting and analysing data on them such as their product preferences, buying

habits etc. Often linked to software applications that run call centers and loyalty cards for example.

The C part of ICT refers to the communication of data by electronic means, usually over some distance. This is often achieved via networks of sending and receiving equipment, wires and satellite links.

The technologies involved in communication tend to be complex. You certainly don't need to understand them for your ICT course. However, there are aspects of digital communications that you need to be aware of. These relate primarily to the types of network and the ways of connecting to the Internet. Let's look at these two briefly:

**Internal networks:** Usually referred to as a local area network (LAN), this involves linking a number of hardware items (input and output devices plus computer processing) together within an office or building.

The aim of a LAN is to be able to share hardware facilities such as printers or scanners, software applications and data. This type of network is invaluable in the office environment where colleagues need to have access to common data or programmes.

**External networks:** Often you need to communicate with someone outside your internal network. In this case, you will need to be part of a Wide Area Network (WAN). The Internet is the ultimate WAN - it is a vast network of networks.

3.    ICT in a Broader Context

—    The nature of information (the "I" in ICT): this covers topics such as the meaning and value of information; how information is controlled; the limitations of ICT; legal considerations.

—    Management of information: this covers how data is captured, verified and stored for effective use; the manipulation, processing and distribution of information; keeping information secure; designing networks to share information.

—    Information systems strategy: this considers how ICT can be used within a business or organisation as part of achieving goals and objectives.

# Chapter 7
## Use of ICT technologies in Daily Life

## A) Education

Computers are used in the sector of education because they can offer:

(a) Interactive experiences.

(b) Enhanced learning.

(c) Cognitive development.

In education:

(i) **Teachers:** Teachers use computers to research for teaching materials, participate in online forums and online conferences as well as to aid their teaching.

(ii) **Students:** Students use the computers as reference tool. They use computers to browse the Internet to look for information.

(iii) **Researchers:** Researchers use computers to collect and process data.

(iv) **School Administrators:** School administrators use computers for administrative purposes to make sure that the entire operation runs smoothly.

## B) Banking

The computer is the nerve centre of the banking system around the world. It functions to control the entire banking system that also includes `Electronic banking Services'.

(a) Customers can make any transactions at the 24 hour service centers or via online.

(b) Businessmen can save their time by using the online services offered by banks. They can access company accounts for loan applications, business transactions and update on their cash flow at any time.

(i) Bank administrators can oversee the entire banking activity such as reconciliations, inter-branch transactions (IBT),

telegraphic transfer and others by referring to the banking system.

## C)    Industry

Computers are used to facilitate production planning and control systems, to support 'chain management' and to help in product design in the industrial sector.

- In Industry:

    (i)     Workers - use machine that are connected to computers to operate. In some productions, robots are used to take over jobs that are dangerous to the workers.

    (ii)    Researchers - use computers to analyse and collect research data for future reference.

    (iii)   Administrators - use computers to oversee the entire operations in the plant or factory to detect specific errors or defects that occurred in the process.

## D)    Commerce

E-commerce helps in boosting the economy. It makes buying and selling activities easier, more efficient and faster. For this application, computers, internet and shared software are needed.

- In Commerce:

    (i)     Customers use computers connected online with suppliers to purchase products. This method can save time and cost as they do not have to go to any outlets.

    (ii)    Suppliers use computers to keep track of their transactions. All products are barcoded and can be read by the computer scanner to help in determining prices and managing inventory.

    (iii)   Employees use computers and telephones to communicate with their customers for any enquiries. The system helps employees to get the latest updates on inventory to be informed to the customers.

## E)    Other Sectors

(i)     Architecture

(ii)     Arts

(iii)    Career

(iv)     Government

(v)      Healthcare

(vi)     Home

(vii)    Law Enforcement

(viii)   Transportation

(ix)     Travel.

## F)     Faster Communication Speed

(i)      With the Internet, news or messages are sent via e-mail to friends, business partners or to anyone efficiently.

(ii)     With the capability of bandwidth, broadband and connection speed on the Internet, any information can travel fast and in an instant. It saves time and is inexpensive.

## G)     Lower Communication Cost

(i)      Using the Internet is cost effective. It allows people to have access to large amounts of data at a very low cost.

(ii)     With the Internet, we do not have to pay for any of the basic services provided by the Internet. Furthermore, the cost of connection to the Internet is relatively cheap.

## H)     Reliable Mode of Communication

(i)      Computers are reliable. Information can be accessed and retrieved from anywhere and at anytime.

(ii)     GIGO is a short form for Garbage In Garbage Out. It refers to the quality of output produced according to the Input.

## I)     Effective Sharing of Information

(i)      With the advancement of ICT, information can be shared by people all around the world.

(ii)     People can share and exchange opinions, news and information through discussion groups, mailing lists and forums on the Internet.

(iii)    Examples of popular discussion groups on the Internet are:

(iv)    Google Groups (www.google groups.com)

(v)    Yahoo! Groups (www.yahoo groups. com)

## J)    Paperless Environment

(i)    ICT technology has created the term paperless environment. This term means information can be stored and retrieved through the digital medium instead of paper.

## K)    Borderless Communication

(i)    Through the Internet, information and communication can be borderless.

## L)    Social Problems

(i)    There are some negative effects of ICT. It has created social problem in the society.

(ii)    Nowadays, people tend to choose online communication rather than real time conversations.

(iii)    People tend to become more individualistic and introvert.

(iv)    Borderless information at times can be negative.

## M)    Health Problems

(i)    A computer may harm users if they use it for long hours frequently.

(ii)    Computer users are also exposed to bad posture, eyestrain, physical and mental stress.

(iii)    In order to solve the health problems, an ergonomic environment can be introduced.

## N)    Computer Users In Society

The 5 categories of computer users are:

(i)    Home users

(ii)    Small office / home office (SOHO) users

(iii)    Mobile users

(iv)    Power users

(v)    Large business users

**(a)** **Home Users:** The computer is a basic necessity. Each home user spends time on computer for different reasons:

(i)     business

(ii)    entertainment

(iii)   communication

(iv)    education

**(b)** **Small Office / Home Office (Soho) Users**

(i)     Small Office or Home Office users include:

(ii)    Accounting firms, travel agencies, florists and many others.

(iii)   These SOHO (Small Office House Office) users:

(iv)    Use desktop or notebook computers as well as telephones, hand phones and PDA's in completing their task and communicating.

(v)     Work in a small company or work as an individual at home.

**(c)** **Mobile Users**

(i)     Include real estate agents, insurance agents and journalists.

(ii)    Use notebook computers, Internet-enabled PDA's or smart phones.

(iii)   Work with basic business software such as word processing and spreadsheet business software.

(iv)    Use presentation graphics software to create and deliver presentations to a large audience by connecting a mobile computer or device to a video projector.

***Mobile windows based devices can be divided into 3 categories which are:

(i)     Windows Mobile-based Pocket PC

(ii)    Windows Mobile-based Pocket PC Phone

(iii)   Windows Mobile-based Smartphone.

A Windows Mobile based device can help people keep in touch with friends and organize daily tasks.

**(d)** **Power Users**

(i)     Include engineers, scientist, architects and virtual reality animators.

(ii)    Use computers with extremely fast processors, bigger storage and customized software.

(iii)    Work with mini computers that use design to meet the organizational needs

(iv)    Use software such as CAD, CAM and MATLAB

(e)    **Large Business Users**

(i)    Include    Banks, insurance companies, hypermarket etc.

(ii)    Use computers for basic business activities

(iii)    Have e-commerce that allows customers, vendors and other interested parties to access  information on the web.

(iv)    Have e-mail and web browsers to enable communications among employees, vendors and customers.

(v)    Provide kiosks in public location.

# Summary of ICT Systems in Everyday Life

In the Section above, we have identified some of the ICT systems and devices that you use for communication, and which are part of your immediate environment. These devices do not operate in isolation but need to be part of an information and communication system – linked to other devices with the capability to transfer data between them. All the examples above are therefore associated with networks of one kind or another.

Here are some examples of situations where ICT's are having an impact on our everyday lives.

## Finance

Every time you use a debit or credit card, the shop till uses a terminal connected to other computers via a network. Your identification details are automatically transferred from your card to your bank or credit card company for verification, and your balance adjusted accordingly. This also applies if you are shopping online, or over the phone (when booking a cinema ticket, for example). ATMs (also known as cash points) allow you to check your bank balance or withdraw cash from wherever you are in the world. The machines are networked to a central computer, which has records of your account in a filing system known as a database. Many banks also provide banking services via the internet, minimising the need for customers to visit a branch.

Financial services have undergone big changes in recent years as a result of the development of ICT systems. This has led to the need for increased

security procedures to combat new types of fraud. It has also led to changes in many areas of commerce; for example, the role of travel agents has changed as more people book their own holidays directly online.

Some types of business have disappeared completely as online and computer-based information have taken their place. For example, you rarely see door-to-door insurance salesmen these days! Similarly, new types of business have been created, such as online auctions like eBay. Existing business types have been transformed through the use of ICT systems, for example the development of online booksellers such as Amazon.

## The Internet

As well as impacting on the commercial world, the internet has had an enormous impact on all areas of life. While there are still people in many parts of the world who do not have access to an internet connection, the majority of people in the developed world now have access either at home or at work, and have the opportunity to use online information resources, or communicate with others using email, instant messaging or discussion groups. New online communities have developed and existing communities have created new ways of communicating. However, issues of identity and security have become a concern. New technologies have engendered new types of crime, including identity theft and financial frauds. These problems have fostered the development of new security technologies.

The internet has become a major factor in enabling information sharing and has had a huge impact on the availability of information of all kinds. Material on the internet reflects widely differing viewpoints and sources: from official news bulletins to unofficial rumours, and from commercial megastores to community portals. The internet has revolutionised the way information can be published, raising questions about the authority and regulation of content. Because of the way the internet has been designed, no individual government, company or person has control over it.

## Entertainment

The world of entertainment is constantly evolving with the advent of new technologies. Digital broadcasting has changed the way we experience television, with more interactive programming and participation. Digital cameras, printers and scanners have enabled more people to experiment with image production. Computer gaming has been an important influence in the development of graphical interfaces. Technology has been at the

forefront of changes in the production and distribution of music, as well as in the ways in which people can access and listen to music.

## Public Services

In Hospitals, patient records are easily shared between departments within a hospital. These electronic patient records may soon be transferable across the whole health service, so that medical staff can access them from any part of the Hospital. In some places, especially remote rural areas, doctors may be able to make use of computer networks to make a diagnosis if they are unable to see the patient in person.

Passenger information is increasingly available via networked computers: for example train timetables, information at stations and airports, real-time information over the internet. Networked communication systems are also crucial in the control of transport systems, from traffic lights and pedestrian crossings to air traffic control and train signals.

Many government services are now available online. For example, you can renew or apply for a birth certificate, claim benefits, fill in your tax return etc

Many industries make extensive use of computerization to monitor and control various production processes. In fact, many manual processes now use Computer control.

It is the computer's ability to be able to monitor what is happening 24 hours a day, seven days a week, and the precision with which it is possible to work which has lead to the downfall of these often boring and tedious tasks being carried out by manually-operated machines.

The over-riding factor is, of course, an economic one. If it were more cost effective to use manual labour in the industrialised world then computers would not have been introduced in the great profusion, which we find today.

## Robotics

At present, robots tend to be able to do very specific tasks very well. These machines are devices such as drills and milling machines and can be observed carrying out automated processes in many modern industrialized plants. It was the automobile industry, where these automation processes were proceeding at an extraordinary pace, which acted as a spur for the development of these specialized robots.

At the other end of the spectrum, personal robots have appeared on the market. This is more like the image the public has of a robot, but

unfortunately, the technology to implement all the expectations from such a 'human-looking' machine is not at a sufficient stage of development. Nevertheless, researchers in Japan are actively working on domestic robot technology that will literally be able to do the cleaning around the house.

## Monitoring and Using Energy

Computer control can be used to virtually control any process, even those involving energy. This is due to the enormous variety of sensors available that convert physical quantities into electrical signals, and the huge variety of control equipment that can be used to switch external devices on and off, or cause things to move. In these systems it is the computer which acts as the decision-making element under the guidance of a set of instructions which control the process. For example, monitoring the pressure of a boiler in a power station – too much pressure and the boiler might explode with devastating effect.

Computers also have the edge when it comes to speed and efficiency. It would be impossible, for example, for a person to take readings at a rate of 1,000 per second – this is of course no problem for a computerized system.

## CAD-CAM

Computer Aided Manufacturer (or CAM) is the entire process of getting computers to aid many or all of the stages in a production process. It is done by using a variety of machine tools or robots.

It is a natural consequence of computerization that, if the data for a component's manufacture exists in a Computer Aided Design (CAD) package, and if the machine that produces or assembles the components can be controlled by machine code, then all you have to do is to translate the numbers from one system to the other, and then you have an integrated design and manufacturing base.

In some factories it is literally possible for the designer to produce all the information that can control an automated factory. A typical example can be found in the electronics industry. For example, a components and parts list could be automatically generated from the initial design on the computer.

# Chapter 8
## Primary Data: Survey of Current Status of ICT in NGO's

This survey was conducted in 2012 by Independent researchers.

The objectives of the survey were to:

- Establish the effectiveness of Indian NGOs with regard to Information Communication technology (ICT) usage.

- Reflect on how NGOs are using ICT in unique ways within development initiatives.

- Establish whether ICT helps NGOs to make a positive difference in serving their constituencies.

- Determine if NGOs are being properly served by the ICT industry.

- Highlight the ICT resources NGOs currently have, and see how they use such resources.

- Review the expectations NGOs have of these resources and what benefits they might gain from such resources.

Independent Researcher interviewed decision-makers at a few (100) non-governmental organizations (NGOs) spread across the country, representing organizations of all sizes and interest groups.

## Executive Summary

More than half of NGOs interviewed say that ICT has had a major impact on their ability to strengthen their work and advance human rights in this country.

While this figure has barely shifted in the past two years, NGOs are now poised to explore the cutting edge of mobile technology and social networking in pursuit of their causes.

Even though a seemingly high 56% say ICT has had a major impact on their work more efforts are still needed to improve the status.

All this may change, as the survey shows that for the first time NGO decision makers are becoming adept at cutting-edge tools like mobile applications and social networking services. Mostly, these are being used in their personal

capacity, with half of all respondents using local social networking services, but only 6% of them using it in pursuit of the goals of their organisations.

In the past, people have tended to learn how to use the Internet from exposure at work, and then extended that to their personal lives. We are seeing the reverse process at work here.

The survey also reveals that NGOs are rapidly embracing advanced functions of cellphones, with exactly half of them using the calendar and organiser functions of phones for organisational use, versus only 24% using those on a personal level. Similarly, 48% of NGO decision-makers are using the Internet browsers on their phones to access information for their organisations, while only 25% of them are using mobile browsers in a personal capacity.

Conversely, 51% have embraced instant messaging on the phone for personal use, while only 16% use it for their organisations. A slightly larger proportion (20%) use instant messaging on computers, with a further 43% indicating that they intend to embrace this option. "This suggests that NGOs still see the new forms of communication offered by social networks and instant messaging as personal tools rather than organisational, but are aware of their capabilities." "This highlights the potential of these tools once their role can be more clearly defined and promoted."

Where the value to the organisation is clear, uptake of advanced applications is clearly under way. Already a quarter of NGOs are using the short code system offered by cellular networks as a fundraising tool, and 28% are using cellphones to collect information in the field. A quarter of NGOs are also using custom applications, such as medication maintenance systems on phones for HIV or TB patients.

"One of the key issues highlighted by the study is that only 39% of NGOs have a technology plan in place," says Barnard. "This is the first step in making technology work for an organisation, and it's a step that most NGOs must urgently take. The findings of the study will hopefully encourage more action in this regard."

Indian NGO sector: There are approximately 300 0000 ( 3 million) NGOs operating in India, of which 53% are less formalised, community-based organisations working at local levels. The total operating expenditure of the sector was R9.3 billion in 1998, representing 1.2 per cent of the gross domestic product. The sector employs approximately 650 000 people or 9 per cent of the formal non-agricultural workforce.

Although not all of these organisations are involved in "development" work, a major percentage of these organisations are involved in some form of development activity.

Based on some research in other countries, the following broad ICT trends have been identified, which is true of the Indian scenario as well:

- Many NGOs have little internal ICT capacity and infrastructure;

- Very few NGO are interested in ICT issues (apart from their primary focus) to the same extent as their interest and/or involvement in other development issues such as housing, gender, human rights, education, etc.;

- Very few NGOs specialise in ICT issues as their primary and/or secondary activities;

- NGOs face numerous challenges in keeping up with rapidly changing ICT developments. These include developing internal organisational and educational processes, planning and implementing technology investments, developing and implementing electronic communication strategies, and staying abreast of a wide range of ICT policy issues that impact on the sector.

Some of the main contributing factors in this regard are the cost of ICT services, unreliable service providers, changing operating environment, ignorance, lack of overall strategic direction, and lack of training and support. This has resulted in the uneven adoption of ICT across the sector, and without a significant change in the status of any of these factors, the potential impact of ICTs on the work of Indian NGOs will continue to be limited. Furthermore, the past two years was a very challenging period for NGOs. The global recession forced many NGOs to cut costs, scale-back programme activities and find new strategies for to generating funding and other resources, and capitalising on the potential of the Internet, both at the individual and broader NGO community level in order to bring Indian NGOs into the online environment. Moreover, given the global reach of the Internet, local NGOs should be informing global discussions and debates and, more importantly, influencing the global development agenda. Indeed, the Internet heralds a strategic opportunity for the future of NGOs as it provides an efficient way to channel information about their activities and engage with constituencies, including donors, government, private sector, general public and community partners. Embracing and integrating ICTs as a tool for communication, organisational development and service delivery represents

huge opportunities in the process of transforming and strengthening the Indian NGO sector. The challenge is to expose NGOs to ICT issues, encourage them to take an active interest in these issues, sustain and expand this interest, and harness the power of ICTs in meeting their development and organizational objectives.

This survey forms part of the process of highlighting the importance of ICTs in the Indian NGO sector. The survey results will, therefore, be used to raise awareness and deepen interest in the potential role and contribution of ICTs in support of the Indian NGO sector.

# Methodology

Independent Researcher conducted interviews in 2012 with 100 ICT and financial decision makers in the NGO sector. These were selected from a broad spectrum of NGOs across India, utilising (http://ngo.india.gov.in), an online directory of Indian NGOs and development organisations.

# Geography

The methodology was based on the sample being nationally representative. The geographic spread achieved was 50% nationally based and 50% regional based, so it was quite even scope wise distribution of samples.
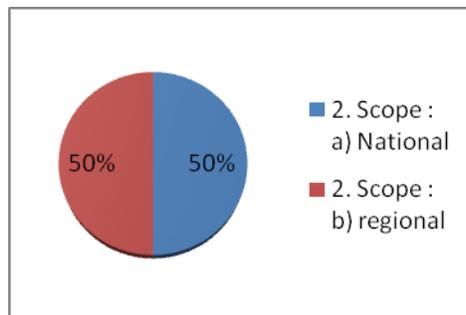


Now these NGOs were checked on the basis of working, whether they work in cities or villages; the following was our sample rate:
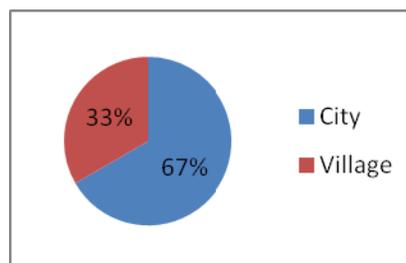
67% NGOs work in cities and only 33% among the sample work in villages, Rural places generally saw low NGO representation. This reflected lower representation of NGOs in these areas, as well as the difficulty often encountered in effectively reaching NGOs in these areas.

Program areas: Major program areas are headed by Community Development with 39%, followed by Social Services and Child Welfare.

# Size and scale

## Number of branches:

In terms of infrastructure size from a branch point of view, 76% of the sample consists of single-branch NGOs, and 12% of two branches and less than 5; 12% have more than 5 branches.

**Full-time staff:** Looking at the range of full-time staff employed, a widely representative sample is seen:

- 72% have from 1 to 10 staff members

- 16% have from 11 to 20 staff members

- 8% have from 21 to 30 staff members

- 4% have 30 or more staff members

Another way of looking at this employee base is that 50% of responding NGOs had 5 or less full-time employees, 22% had 6-10 employees, 16% had 11-20 employees, 8% had 21-30 employees and 4% had 30 or more employees.

**Part-time staff:** When looking at part-time staff, a different picture emerges. There are more part-time staff members in NGOs as compared to the Permanent staff. 20% percent of NGOs employed part-time staff members, 22% percent employed two part-time staff members and 35% employed three to nine staff members part-time. 22% NGOs had more than 9 part-time members; they basically work on ad-hoc basis or contract basis. Whenever there is work they are called and when no work is there then they work in other organizations. Basically, these are free lancers working on availability, This reduces the NGO overheads a great deal.

**Volunteer staff:** Volunteer staff statistics show that 10% of NGOs with 50 or more staff members have volunteers on board.

Four percent of NGOs with one staff member employ volunteer/s. In the size category two to nine staff members, 25% of NGOs make use of volunteers.

For NGOs with ten to twenty staff members, 12% make use of volunteer workers, while of NGOs with 21 to 49 staff members, 5% make use of volunteers.

## Roles of Respondents

More than 71% of the respondents were CEOs, Managers or Finance Managers.

## Roles of Respondents

Finance Manager/Administrator

CEO/Manager

Other

ICT Manager

Media and Communications Managers

Fundraiser

Website Manager
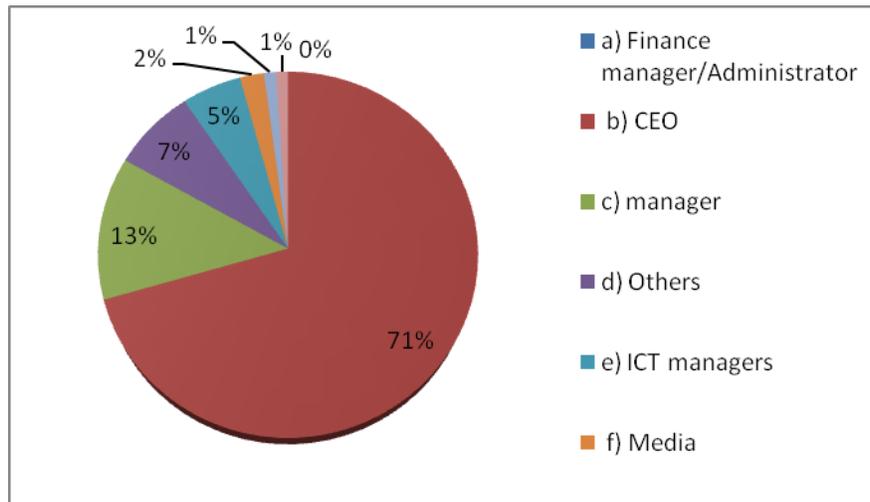


Looking at this in the chart format, "Others" made up 7% of this sample, ICT Managers made up 5% and Media and Communication Managers made up 2% of the sample surveyed:

## The Findings: IT usage

This section presents the findings of the survey, beginning with findings and insights into computer usage amongst NGOs.

Computers and networks

Computers in the organization

9% of NGOs had only one desktop computer. The majority of NGOs (59%) had from two to nine desktop computers. Another 6% had 10 desktop computers while 17% had 11 to 20 desktop computers. Very few had more than that, with only 4% having 50 or more desktop machines.

The research also shows that 28% of NGOs had more than 10 desktop machines.

This further reinforces the growth of mobile devices in NGOs.

Moving onto the numbers of laptop computers, 24% of NGOs had one laptop computer while 14% had two laptops. Eleven percent had from six to ten laptop computers. Only 7% had 11 or more laptops.

The need for mobility amongst NGOs is similar to SMEs and the growth in the number of laptops will continue to increase in line with the market. This will necessitate greater attention to mobile applications and backup solutions.

Regarding numbers of servers, 50% of NGOs had no server and 26% one server while only 7% had two or more servers. With the growing number of desktop computers, laptop computers and servers, as well as the growth in penetration of all forms of computers over the past two years, it is clear that NGOs rely on ICT to a high degree and can be classified as mainstream computer users.

Computer operating systems used

This chart shows the main computer operating systems used:
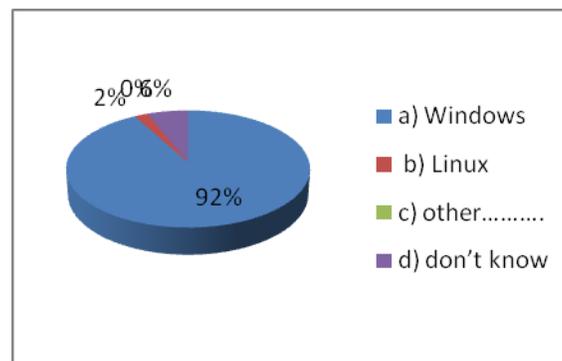


By far in the lead is Windows with 92% usage by NGOs,

Windows XP - (72%) is followed by:

27

- Windows Vista - 8%

- Windows 2000 - 8%

- Don't know - 5%

- Windows 7 - 3%

- Windows 98 - 2%

- Linux 2%

Windows remains the dominant operating system in use. Despite the progress in open source software on the desktop, Windows operating systems represent a total of 92% of OS used by NGOs. This figure may be closer to 97% if the "don't knows" are taken into account.

## Computer networks

Respondents were asked if their computers were networked. A resounding 90% replied in the affirmative.

Those who used networking, network their computers as follows:
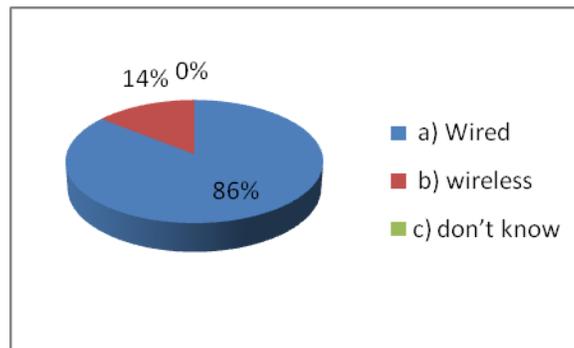


Cable is the first choice networking method, with 84% using Cable followed by Wireless with 16%. Wireless is growing. This is a good indicator of NGOs using technology to help their organisations operate in a more effective manner. Not only is NGO network infrastructure mainstream, but it is increasingly going mobile.

Respondents were then asked which network operating system is used on their networks: Windows NT server saw the largest proportion of users at 25%. Following this was:

- Windows 2008 server 20%

- Don't know 17%

- Windows 2000 server 8%

- Others 3%

Most NGOs (53%) use a version of Windows as a network operating system. Only 3% use an open source network operating system. Once again, the 17% of "don't know" respondents were in all probability using a form of Windows networking software, bringing the total of Windows users to 70%.

## Office software in use

Microsoft Office was the leading office software suite used, by a large margin:

- Microsoft Office 95%

- Open Office 1%

- WordPerfect Office 3%

Microsoft Office is the most dominant application in the Office Productivity Suite market.
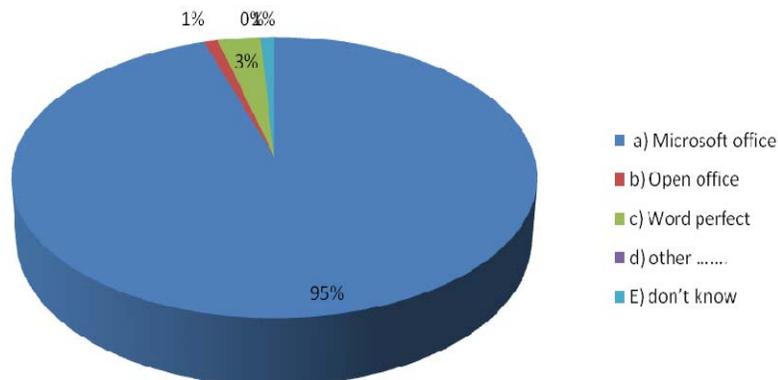


Despite application compatibility and free availability, open source Office Suites have not made any impact, and this trend will continue to track the growth of mobility in this sector.

# Telecommunications services

The telephone, facsimile service and e-mail, are the services mainly used for telecommunications in the NGO sector.

Fixed- line telephone sees a 92% usage figure followed by:

- E-mail 95%

- Fax 93%

- Mobile telephone 80%

- VoIP 2%

There has been a slight reduction in fixed line telephone penetration, due to mobile telephone availability, E-mail use has significantly increased as almost all NGOs use it accompanied by matching reduction in E-mail and fax usage. The reductions are not statistically significant; both on the local and international level there is a trend to move to mobile communication services. This is one sector where a significant move to mobile communication solutions is expected to emerge in the next few years.

It is also noticeable in the telecommunications used chart for NGOs that VoIP usage has increased slightly. This would be due to NGOs trying to save costs, for example in times of recession, as well NGOs embracing technology and using VoIP instead of land lines and mobile lines.

# ICT adoption

## Level of technology adoption

Organisations were asked to rate their own level of technology adoption. The results were equivalent to those observed in measuring the rate of technology adoption among small and medium enterprises (SMME) in India.
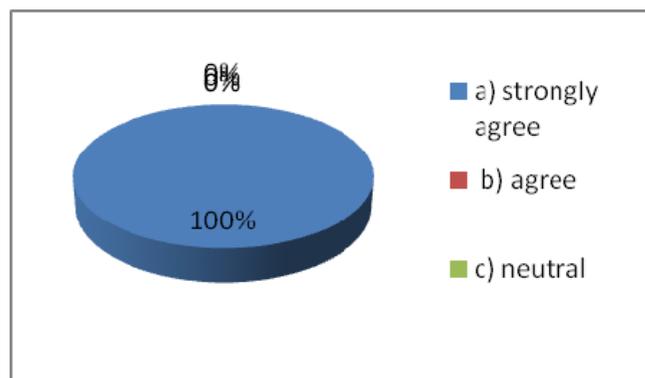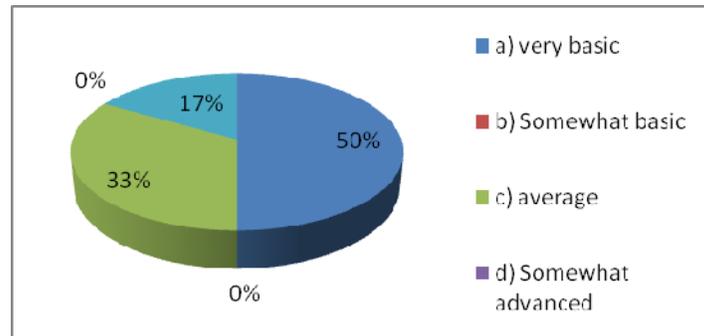
None of the NGOs indicated that they are Very Advanced in their levels of technology adoption, with 17% being Somewhat Advanced in this area. Almost thirty three percent of NGOs indicate (33%) that their level of technology adoption is average with 50% having Somewhat Basic levels and having Very Basic levels.

The survey indicates that only 33% of NGOs are advanced in their level of technology adoption.

This indicates that Technology adoption is growing in this sector.

NGOs are increasingly utilising technology, as 50% are saying they are in a Basic stage of technology adoption. 33% regard themselves as merely Average. There is thus great potential for pushing advanced usage of technology among NGOs. The opportunity exists for far greater adoption of technology within the NGO sector with 83% of NGOs at the average to below average Technology adoption levels.

## Use of accounting software

Most NGOs make use of some form of accounting software; almost all (100%) says so doing so as illustrated in the chart below:
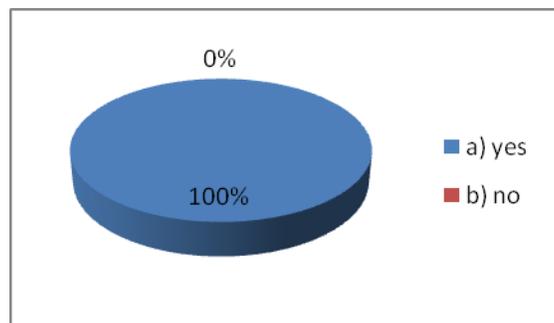
Thus there is no room for improvement in this arena. Looking at the type of accounting software actually used, Tally (72%) is the most widely used form of accounting software amongst NGOs. This dominance of Tally is not very abnormal as apart from the cost and availability factor, the ease of use is an added advantage, which shows that in some respects the NGO sector mirrors the SME sector.

It is anticipated that this area of online web-based accounting solution will grow significantly in future; but, of course, there's still a long way to go.
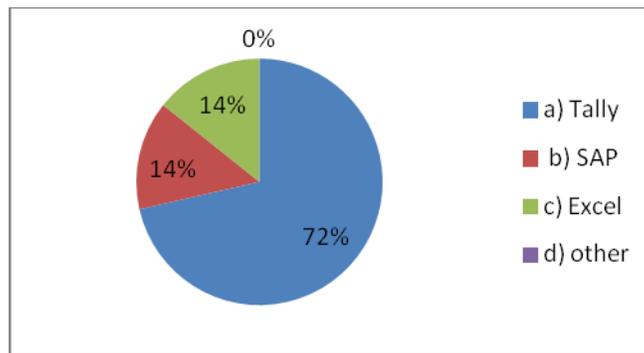


## CRM software use
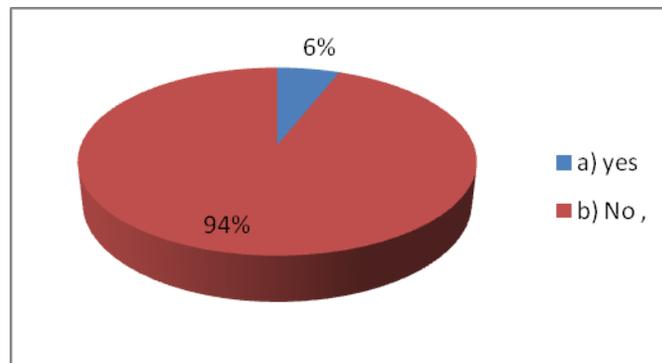


Six percent of respondents use CRM (Customer Relationship Management) software.

The following chart shows those not using CRM, and shows the main systems in use amongst those who use CRM as a strategy:

Of those using such software, MS Excel heads the list followed by other packages. and MS Outlook. Microsoft products together are more popular than all the other products combined.

It is notable that the dominant software used is not specific CRM software (MS Excel being the dominant software used). Most NGOs using CRM are really adapting Microsoft Office products, specifically Excel (a spread sheet package) and Access (a database package).

There remains a large area of growth as CRM has many benefits for service type organizations such as most NGOs, both in delivery of their primary mandates, and in advocacy.

## Support for systems and software
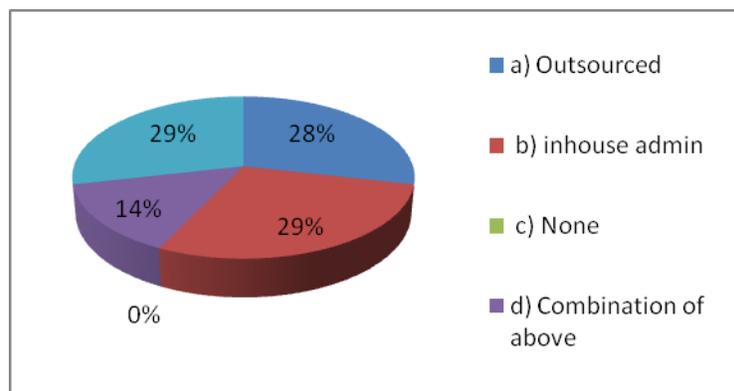


Respondents were asked who provides the support for their ICT systems and software. There is quite even distribution here.. Some NGOs (28%) outsourced this function. The in-house figure was 29%,. Amazingly 0% did not have such support as they say without support it is not possible to run this infrastructure.

Most NGOs did not know who their external ICT support provider was or found this question not applicable to themselves. When they did not know the answer, it seems that a mix of individuals was used along with a smattering of well-known names. There is clear room for improvement in this area. As ICT becomes more and more critical in the delivery of most NGO services, the support service providers and support structures will become more critical for NGOs.

NGO knowledge and awareness regarding who their external ICT support provider can be summarized as follows:

There is a great deal of room for improvement in this area, both with regard to awareness and the knowledge amongst decision makers of who conducts this function. Responses received show that only 29% of NGOs used a dedicated ICT person for internal ICT support. Seven percent used an ad-hoc staff member.
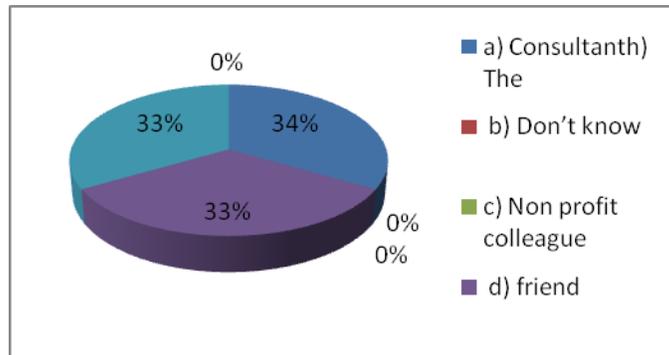
When asked about their most trusted source of ICT advice, 34%. Other NGOs were mentioned by 33% of NGOs and Friend

It is apparent that the specialised services of a consultant lead the way in 2012. However what stands out in the 2012 survey is that Non Profit Colleague (3rd place on the list) and Friend (in 4th place) are ranked higher than the 5th places Systems Integrator, and together at 33% are the single largest area of advice.

There is great potential for IT service providers to offer more comprehensive services to the NGO sector in this regard. It appears that very few Integrators and suppliers of ICT services have targeted the NGO sector as a distinct market.

## Security measures
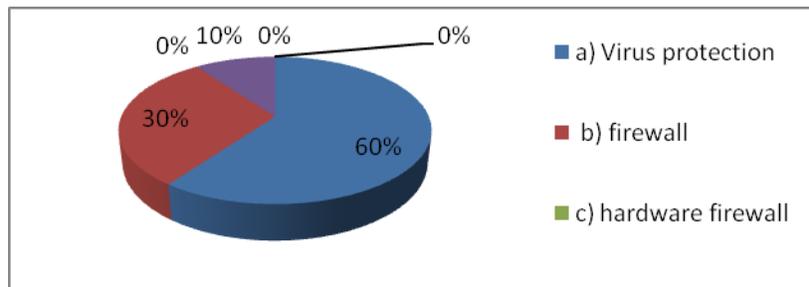


NGOs mostly have virus protection, with 90% having this security measure in place. A large percentage of NGOs (60%) have a Software Firewall in place, and 10% have a Hardware Firewall in place. Only 2% of NGOs have no security protection measures in place which is a low figure but may be even higher.

Not much investment is seen in NGO sectors on security; the most is virus protection followed by firewalls, but these firewalls are mostly freewares.

Fortunately, only 2% of NGOs have had no security measures in place in 2012.

## Internet connection

Connectivity and access to the Internet is of crucial significance with regard to the performance of NGO functions and operations. As such, the connectivity issue was dealt with from several perspectives.

## Form of internet connection used
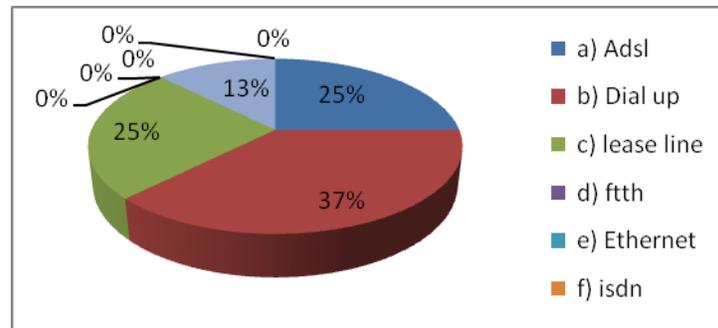


The main form of Internet connection used by NGOs is Dial-Up. This is mostly because of rural areas, or, I think they confuse dialup of PPPoE ( in case of adsl) with dial up, otherwise ADSl is widely used ADSL, with 25% using it. Next on the list is Ethernet with 13%.

ADSL is by far the connectivity method of choice. These findings are opposite to those found in the SME Survey 2012. That survey had listed ADSL as the first choice Internet connectivity method, with 73%, It had Dial Up at 4% usage, with 8% for Wireless Broadband.

The survey shows there is still need for broadband penetration specially in the rural areas.

## NGO Satisfaction with quality

Survey respondents were asked to rate on a scale of 1 to 5, where 1 was Least Satisfied and 5 was Most Satisfied, how satisfied they were with the quality of various technology elements utilised.

## Satisfaction with Internet connection

Satisfaction is 83%: NGOs were satisfied with their Internet connections in general.

The last two years saw the continued roll out of various technologies like WiMax, Wi-Fi and 3G Wireless technologies. The hype around newer Internet

connectivity technologies did not always translate into a seamless Internet experience, allied to promises of broadband speeds not always being met.
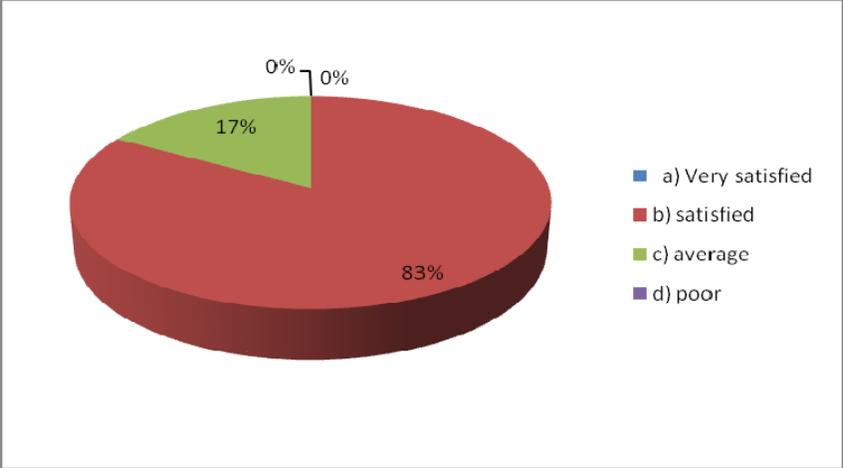


Around a quarter of NGOs (17%) were neutral on the matter while none seemed dissatisfied. This might be due to fact that those using internet are not using it for so heavy traffic but mostly for email purposes as higher bandwidth are used in case of multimedia applications. Another critical factor is that once an organization becomes dependant on Internet connectivity, the stability and quality of that connection becomes more critical to the user than access. This is supported by the continued movement of SMEs, and NGOs, from wireless to fixed connections such as ADSL.

## Satisfaction with computer hardware

72% of NGOs were satisfied with their computer hardware. This shows the majority are generally happy and don't expect much from computer hardware.

When you couple this with the lack of dedicated support resources, it is clear that greater emphasis needs to be placed on support services in order to ensure that mission critical systems are properly maintained and supported.
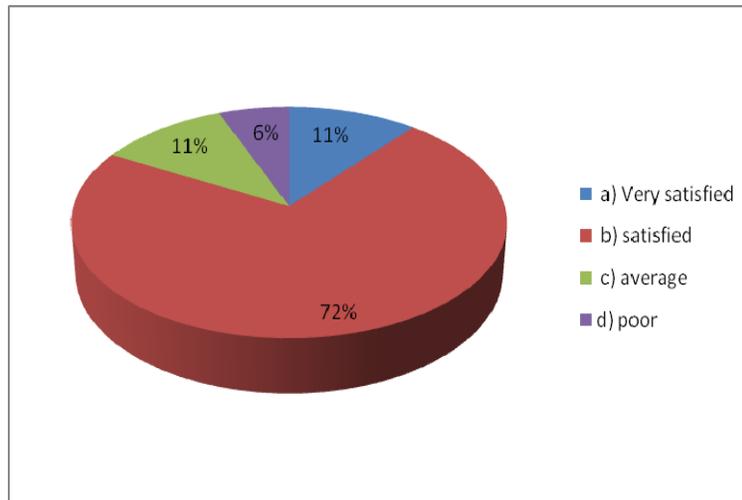
Only a handful, just 6%, were dissatisfied with the hardware. On a detailed study it was discovered they were the ones who used computer most, and some with advance needs. Hence one more thing comes out of the survey: there is need for more education on usage of these hardware for different purposes.

## Satisfaction with network

The results of survey on hardware and network satisfaction were similar, As most NGOs have one computer, they don't have much issue with networks; the dissatisfaction part comes from the NGOs using multiple computers and servers.

**Satisfaction level:** Encouragingly, only 6% were dissatisfied, and this pattern mirrors that for hardware satisfaction and supports the issue of formal support structures.
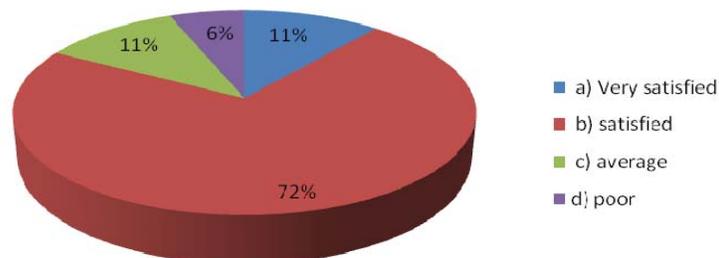


## Satisfaction with office software

72% of NGOs were satisfied with their office software suites, with only 11% indicating that they were not satisfied. The office suites in use were

predominantly Microsoft Office, and the low level of dissatisfaction supports the dominance of this product in this sector.

There is still room for improvement as 17% of the NGOs surveyed were neutral and 40 % were somewhat satisfied.

**Satisfaction with general software:** 72 % of NGOs were satisfied with their general software setups, with only 11% feeling dissatisfied, as can be seen in this chart below:
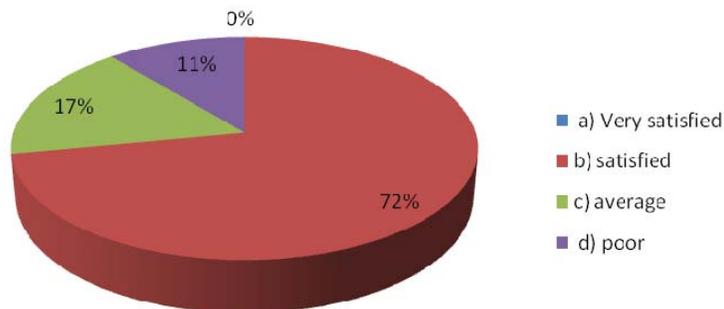


## Satisfaction with open source software

Now as seen in the survey as well, not many NGOs/NPOs are using open source software, most of them are using Microsoft and are very comfortable on the same.

Although only a fraction of them uses open source software, those using it were quite educated and experts and they were satisfied with the software as open source means free for them and that means less expense.

So among NGO's using open source, 88% were satisfied, 10% neutral and only 2% dissatisfied.



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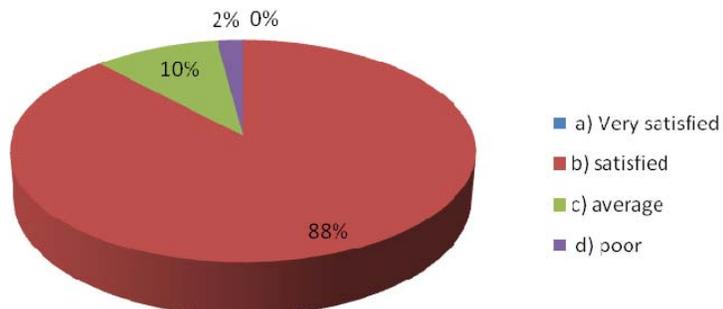
## NGO Satisfaction with Cost

Respondents were asked questions relating to satisfaction with the cost of various technologies.

## Satisfaction with Internet connection cost

32% percent of NGOs were satisfied with their Internet connection costs. However, almost a half of NGOs (54%) were neutral on the matter and 14% were dissatisfied - indicating a certain level of unhappiness felt by NGOs in this area.

It is clear from the responses that the benefits of the Internet connection outweigh the cost of that connection for most NGOs.
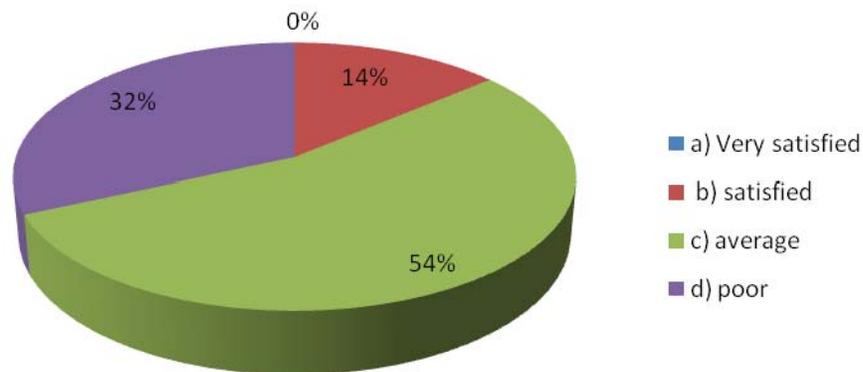


On further study, it has been found that although internet rates have fallen in past few years, they are still high compared to other costs involved in ICT infrastructure. The current plans are based on volume usage or time of usage, which as per general feeling should be kept flat irrespective of usage or time so that constant connectivity is available on cheaper prices.

When compared, Adsl is found to be the most economical in terms of usage and time factor.

## Satisfaction with computer hardware cost

Nearly two thirds (67%) of the NGOs were neutral on this topic, indicating that hardware costs are not a significant inhibitor to the uptake of technology for many NGOs. 17% were satisfied with computer hardware costs. 16% were very satisfied with hardware cost.

It is pertinent to point out that in India apart from reputed vendors, the computer hardware is also assembled and sold which forms the major share of computer

hardware in use here and compared to other parts the hardware cost is cheap in India and matching users' expectations.
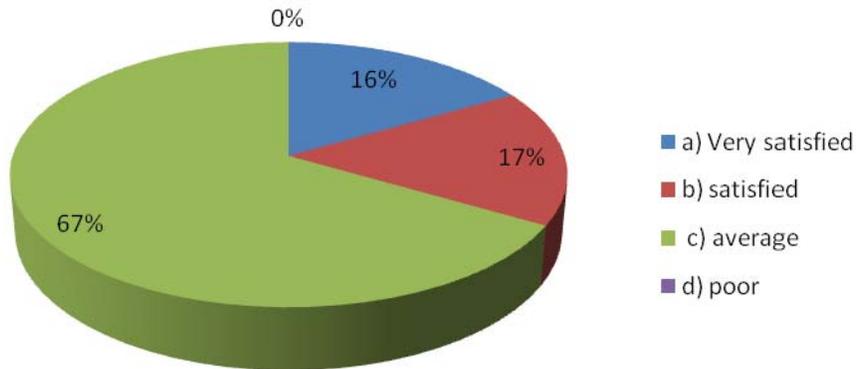


## Satisfaction with network cost

Exactly two-thirds of NGOs were again neutral on this point. Twenty five percent of NGOs were satisfied with network costs and only 1% were dissatisfied. The increase in adoption and generally ubiquitous use of network technologies support the mainstream nature of the NGO sector and the competitiveness of supply to this sector.

One more factor involved is that in networking most of the NGOs were using small hubs or switches which are not very costly and ful- fil the purpose of connectivity. Other than that no investment was seen in software for networking.
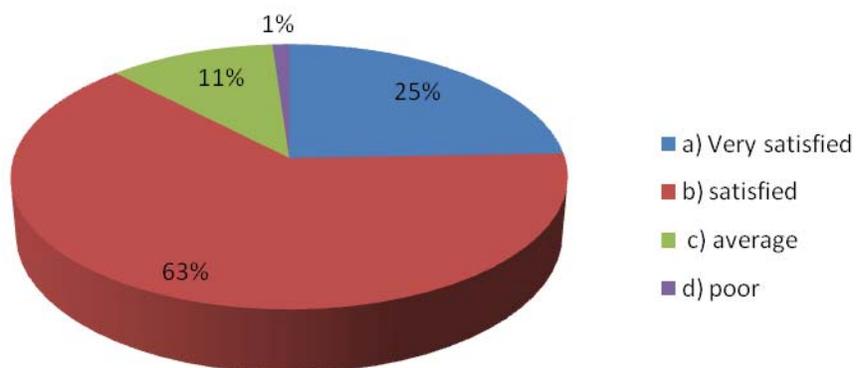


## Satisfaction with office software cost

Now, when it comes to software costs, a change in pattern was seen, The cost of softwares (original) was very high but on survey it was found that almost 60% used pirated software and they were not even aware of the same as their

40

administrator or computer hardware vendor had installed it for them which they claimed were purchased softwares.

The softwares most commonly used by NGO's are,

1.      Windows software

2.      Windows office

3.      Antivirus

4.      Microsoft mail

5.      Utilities like –zip, sms etc

As per survey, around half (45%) are dissatisfied with the office software cost. Only 14% percent of NGOs were satisfied with office software costs and 40% were neutral.

The indication is that once again this element is a big barrier in India to ICT adoption for NGOs. It also indicates that the NGO/NPO's were not well informed about the low cost options available to NGOs.
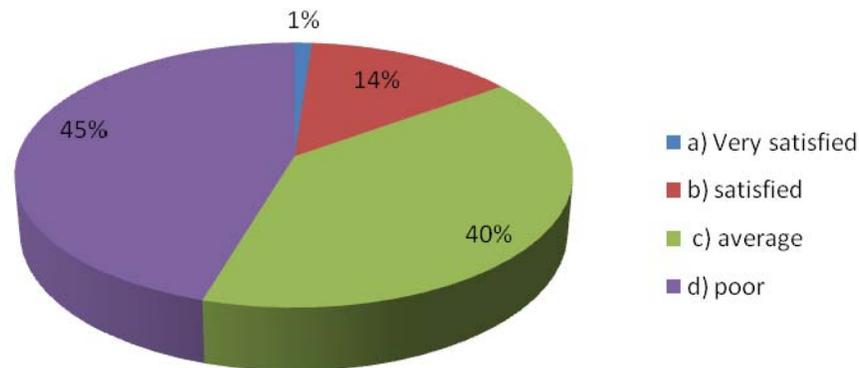


## Satisfaction with general software cost

The ratio was very similar to overall software cost survey with most of them dissatisfied with the cost, hence a lot of things need to be done with the low cost options.
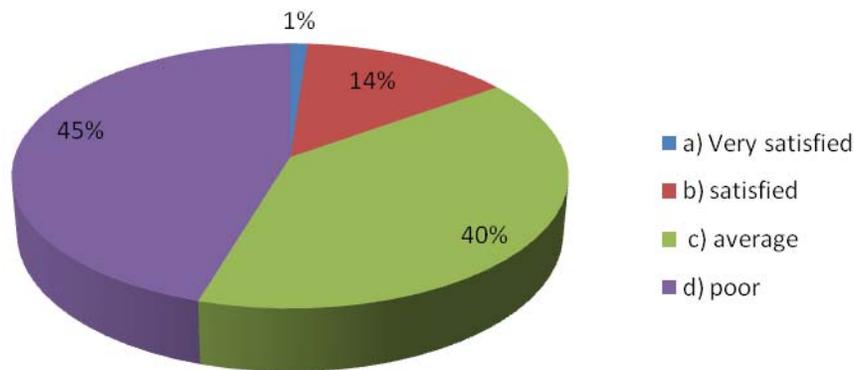
## Satisfaction with open source software cost

With Open Source software being available via free download, in most cases, this was an interesting question, and the results clearly support the assertion that there is an insufficiently developed open source support and supply infrastructure available to NGOs.

Now as most of the paid software is available for use in India via small vendors, System integrators and hardware suppliers, awareness about the open source software and its working is still very low, Most of the open sources are free to use and those using this software are satisfied with it.

## Satisfaction with Quality versus Cost

A picture emerges whereby NGOs in 2012 are definitely more satisfied with the quality of various technological factors, as opposed as against how satisfied they were on this score a year earlier.

It is clear that open source software is not seen by NGOs in the same light as they see other proprietary software solutions. This is true in relation to quality satisfaction levels and cost satisfaction levels; both are rather low for open source (38% and 32% respectively).

The survey results indicate that NGOs are less satisfied with cost and other elements. The across the board decreases in satisfaction point to the fact that technology may not always be fulfilling its promise.

As NGO sophistication levels continue to grow and the range and reach of the technology-related solutions increase, the lack of support, training and implementation keeps hampering the extent to which the NGO sector can benefit from technology.

It appears that NGOs are rather rudderless within the greater ICT world. The report clearly shows that most NGOs do not have a technology plan in place. Such plans are critical in providing direction for the required ICT components found within NGOs.

## Website for the organisation

A majority of the NGOs surveyed (80%) had a website for their organization.
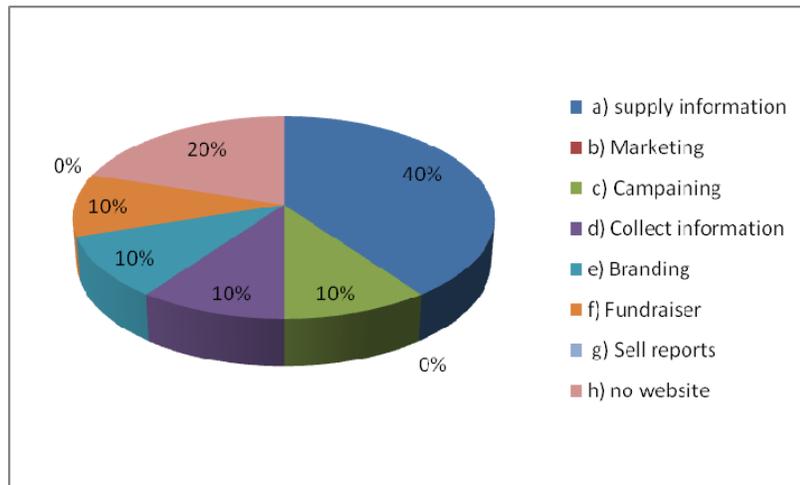


## Role of website

The main task of the websites utilised by NGOs is to supply information (40%). The majority of the respondents clearly see the website as an online brochure to supply information. The lack of understanding, and hence usage of more advanced elements on the majority of NGO sites, further underlines the lack of progress by NGOs in utilizing social media elements in their websites.

Other main roles of the NGO website were:

(i)     Marketing

(ii)    Campaigning

(iii)   Collect information

(iv)    Branding

(v)     Fundraising

Although Fundraise is done using website, as it is not many NGO's have opted for this option.

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Also, one interesting thing is that all the 20% which don't have website belong to rural areas thus indicating that that might be larger percentage of NGO's who don't have websites.

## Website maintenance

An external webmaster is used by 37% of NGOs. More disturbingly, 23% did not know who maintained their websites, and 21% had websites maintained by general staff with content management systems.

Only 1% had dedicated internal webmasters.

It is clear that very little has advanced from a website perspective since there is clearly a lack of understanding of the strategic nature of an organization's online presence.

It is interesting to note that the growth of user maintained websites using freely available platforms has grown. The use of a web savvy internal staff member to maintain these sites once again highlights the general lack of strategic thinking in this area by NGOs.

## Website maintenance software

Respondents were asked what software they used to maintain their websites. A full 83% did not know the answer to this question, 6% answered "others".

This clearly shows the web penetration is not at all done in case of NGO.

Our view is that there is still a lot of potential regarding website usage to its full potential and its reach. The following data emerged when NGOs were asked whether they knew who maintained their website.
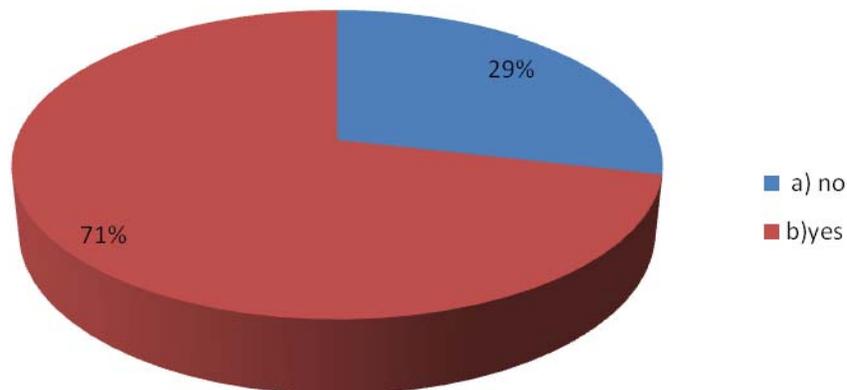
## The mobile web

Only 2% of NGOs have made a version of their website suitable for mobile phones, such asa WAP or.Mobi site out of all the NGO's which have developed their websites.

However, this is similar to the SME sector in India and says more about the enabling environment, than the NGO sector per se. It is expected that this area will show much greater focus and attention progressively.

Web publishing and social media Respondents were then asked which web technologies they used to publish information on the web in general, and not on their own websites. Results show that 65% of NGOs do not engage in such activities. This is a clear indication that the use of advanced web technologies has not yet become pervasive amongst NGO staff. A small bit of progress was indicated, with only 25% making use of photographs on websites, 5% make use of videos on websites such as YouTube, and 5% make use of web Blogging.

The survey participants were asked whether their organizations had a formal presence on social networking. Three quarters had no such

presence. It is clear that NGOs do not generally use social media in support of their business. Facebook saw 62% of NGOs having some presence on its pages, with Linked In 12% in a distant third with Twitter at second with 13%.
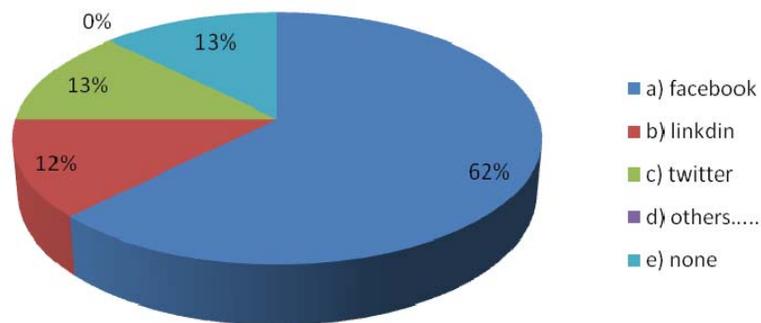


The opportunity for the use of social media to assist and enhance the delivery of NGOs' core business offerings and services is huge. There is a large untapped market for services and consulting in this area of online activity amongst NGOs. Not only do NGOs not use social media in general, but NGOs do not use social media for business either. For NGOs, social media use, goals and results must be quantified beforehand and must be specific as it is the most important component of a good plan.

Usage of social media by the NGO can have measurable and sensational results.

Let's look at an international example where an NGO working in a remote region of the country, for example, created a campaign using social media in order to overcome distances between the community and policy-makers. Cellphones, camcorders and wind-up chargers were all used to create messages that were broadcast on YouTube and Facebook.

By way of example and comparison, NGOs in the United States were the subject of a 2008 study which indicated that the 200 largest NGOs (Forbes top 200 NGOs) adopted social media faster than Fortune 500 companies.6

89% of these organisations used some form of social media, with blogging being the most common tool used, with 57% usage (5% blogging usage amongst Indian NGOs surveyed in this report). Other tools used are podcasts, message boards, social networking, video blogging and Wikis. 45% said that social media is "very important" to their fundraising strategy.

## Online platforms used to raise money

Most NGOs have not used online platforms to raise money. However, 17% have used the online platform.
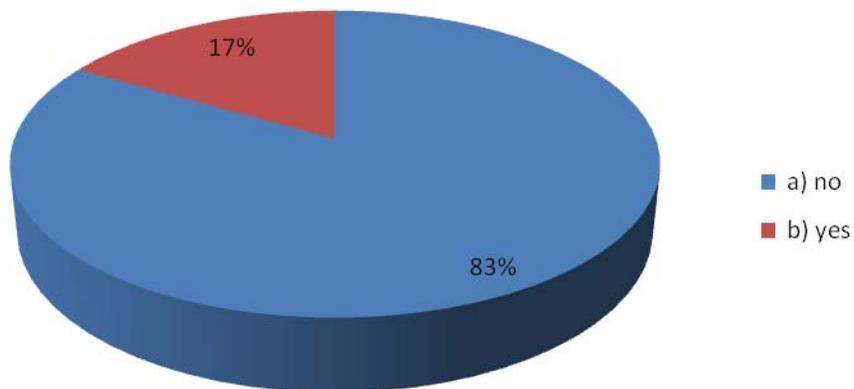


## Technology usage

The following interesting chart shows which technologies NGOs would not use, do currently use and plan on using in the future. Leading the currently used list are these well-known technologies:

- Fixed landline 98%
- Desktop computer 95%

- Laptop computer 85%

- Fixed line Internet access 83%

- Cellphone 87%

- Hosted e-mail server 40%

- Web based e-mail provider 78%

- In house e-mail server 14%

- Data cards (3G) 40%

NGOs clearly use standard technologies such as phone lines, fax and computers for much of their activities. Where they are falling short is in the use of more advanced technologies such as smartphones, 3G cards and hosted cloud type services. There is an indication that the intention to use these technologies, including CRM and advanced ERP systems is there, but the lack of resources, specifically in the support area, will hamper adoption.

Despite massive global growth, NGOs do not currently see the usefulness of Smartphones and GPS devices. It is to be supposed that this is an awareness issue and will rapidly change in the next few years. Applications and uses of smart mobile devices with location awareness will become critical for service delivery over the next few years.

There is ambivalence regarding 3G data cards. Many currently use these cards (40%), while some plan on using them in future (16%). However 39% of NGOs would not use them in future. As mobile applications and connectivity continue to grow, it is expected that this penetration will increase steadily.

## Cellphone features used by staff

NGO staff use well-known features such as e-mail (10%), SMS (79%), Contacts or Address Book (51%), Organiser or Calendar (2%) and Internet Browser (5%) on their cellphones in support of their work. Such features are also used by NGO staff for personal use, but to a lesser degree.
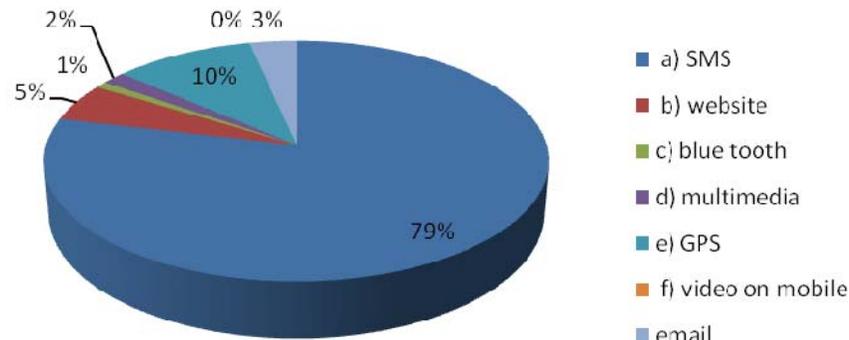
The features mainly used by NGO staff for personal use are:

- Instant messaging 79%

- Local social networking apps (MXit) 12%

- Global social networking apps (Facebook) 12%

- Bluetooth hands free 22%

- Bluetooth connectivity 1%

- Multi-media 6 %

- GPS built into phone 12%

The results above show clearly that the use of mobile devices is limited to calls and SMS, and the use of advanced phones which is almost negligible at present can be a potential growth area. Whilst there is low business usage of this functionality, there is a relatively high usage for personal use. The implication is that should NGOs find a business case for the usage of these applications, there is the capacity for a rapid uptake, as the majority of the staff will be well- versed in their use.

## Importance of cell phone requirements for staff

*E-mail usage out of office*

Nearly 100% thought that it is important to be able to send and receive e-mails, when not in the office, on their cellphones.

*Staying in touch while on the move*:

Over half of respondents (54%) thought it is important to be able to stay in touch while moving around, via the medium of the cellphone.

0%

- a) no
- b) yes

100%
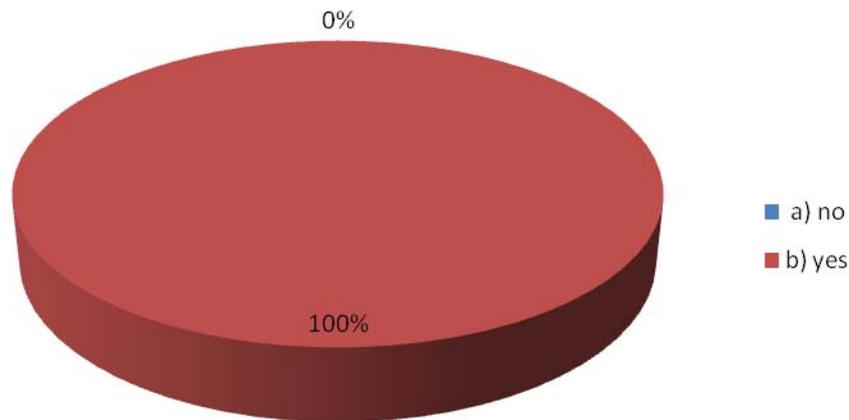
## Ability to access information while not in the office

Again, over half of the respondents (53%) thought that it important to be able to access information while not in the office, by using their cellphones.

*Respond to enquiries at any place at any time*:

Once again, over half of the respondents (53%) thought that it is important to be able to respond to any enquiry from any place at any time, by using the cellphone.

## Remaining informed of office events

Almost 100% percent of the respondents surveyed thought that it is important to be able to remain informed of office events through their cellphones.



0%

- a) yes
- b) no

100%
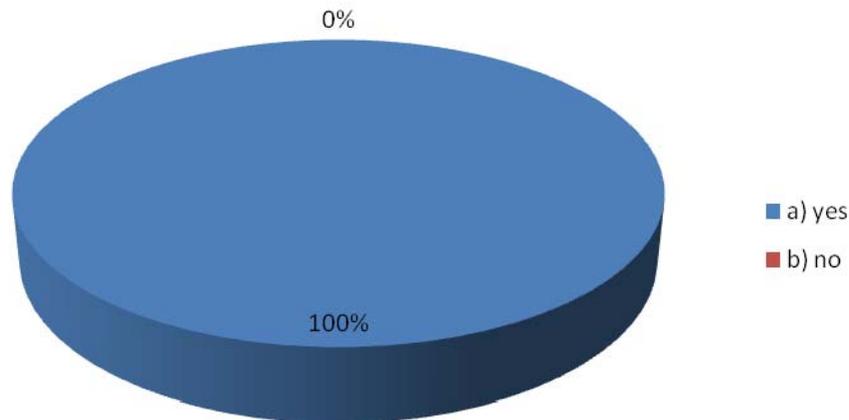
## Immediate response

A total of 83% of survey respondents thought that it is important to be able to respond to an emergency with their cellphone.
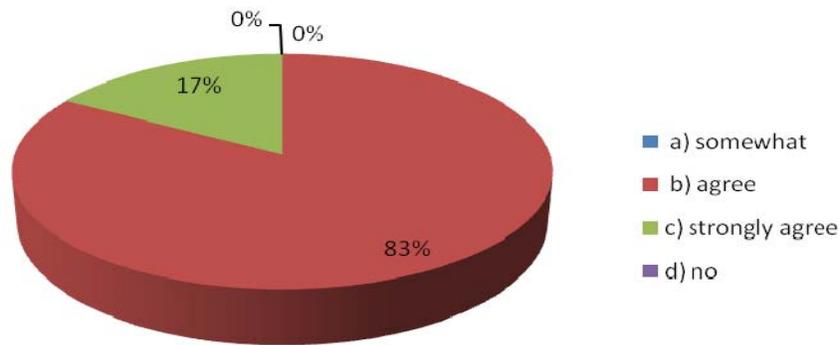


## Manage time

A total of 80% of respondents thought it important to be able to always manage their time using their cellphones. But they prefer to use cellphone for voice calls and to find what time of the day it is; use of calander/orgaiser is still as low as 4%.

## Summary of cellphone requirements for staff

The most important requirement for staff cellphones is to be able to respond to an emergency immediately (83%).

The following are among the next most important requirements for staff cellphones:

- Informed of office events

- Stay in touch on the move

- Respond to enquiries anywhere, anytime

- Access information when not in the office

## Staying in touch with key stakeholders

It is important for NGOs to be able to stay in touch with key stakeholders. This is an important element in any NGO environment. From an ICT point of view, this is done in a variety of ways:

Regarding current usage,

1.      e-mail is used by 96% of NGOs to contact key stakeholders.

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2.    Fax is used by 86%, and

3.    Voice calls by 83% of NGOs.

Interestingly, written letters are still used by 72% and SMS by 54% of NGOs. Online Applications represent a far lower usage (23%), along with a low 20% use of Instant Messaging, and a very low 2% usage of Blogs.

Blogs would, however, be considered for use by 6 % of NGOs, a very interesting state of affairs as it shows the willingness of many NGOs to embrace technology within the information communication field.

Twenty-five percent of NGOs would also consider using Instant Messaging and Online Applications in future.

At the same time, 40% of NGOs would consider using neither Blogs nor Online Applications, 43% would not consider using Instant Messaging.

The results show that many NGOs have no interest in more advanced usage of web technologies. It is not clear whether this is due to lack of experience on these technologies, or no clear business case in the NGO context. What is clear is that people working for NGOs are using these technologies, and they will cross over into mainstream business use at some point.

Education can play a role here with regard to the effective use of advanced ICT solutions in organisational environments.

*Educating staff to use mobile technologies*: NGOs were asked which measures they have in place to educate and train staff on the use of mobile technologies.

A massive and disturbing 91% replied that they did not have measures in place to train, or educate, their staff on the use of mobile technologies. Of those who did reply, these were the measures that were used to achieve the goal of making the staff more aware in the use of advanced mobile technology:
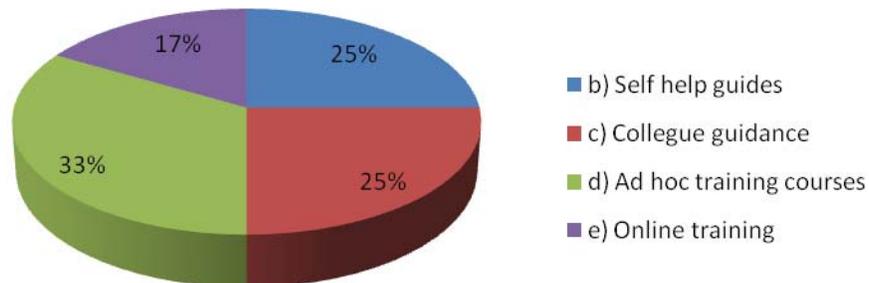


Formal training courses were the most popular with 33%. This is a positive development in that such courses would provide correct and proper guidance. In

the second spot, with 25%, was consulting with a colleague for guidance. In the third place was the use of self-help guides with 27%. Online training is around 17 percent's choice.

## ICT objectives for the coming year

NGOs were also asked which ICT objectives were important to them for the next year. A number of issues were raised, all of which were ranked highly on their importance.

The results indicate that NGOs are very aware of the issues surrounding the use of ICT, and the relevance of ICT to delivery and the operations of NGOs. The major disconnect that may emerge is in the ability of NGOs to actually deliver on these concerns, due to capacity constraints and the lack of dedicated solutions specifically available to the NGO sector.

The top ten NGO ICT objectives for the next year, listed in descending order of importance, are as follows:

1.      Detect threats to systems

2.      System integrity against viruses

3.      Protect/recover critical data/apps

4.      Deliver customer service during disaster

5.      Get more from ICT system

6.      Introduce new business apps to system

7.      Manage costs through better ICT use

8.      Right info at right time to improve services

9.      Align business process to ICT infrastructure

## Revenue spend on IT

NGOs were asked how much of their revenue they spent on IT.

3% could not quantify the amount spent while 21% did not spend on IT.

Nearly half of NGOs (66%) spent between 1 to 5 percent of their revenue on ICT.

Ten percent of NGOs spent between six to ten percent of their revenue on ICT. Only 2% of NGOs spent more than 10% of their revenue on ICT.

## Revenue range

Many NGOs (62%) chose not to answer the question regarding their spending on ICT by revenue range (per annum).

The remainder who did answer the question revealed a fairly flat spread with regard to revenue range. It is clear that NGOs do not spend large amounts on ICT, which once again correlates well with the Independent survey results.

## Technology plan

Respondents were asked about their technology plan. This plan encompasses both hardware and software elements. They were asked whether they had such a plan in place.

## Strategic issues

Respondents were asked on a scale of 1 to 5, where 1 is very low impact and 5 is very high impact, what impact ICT had in general on the abilities of their organisation.

## ICT impact on advancing development initiatives

Again, most NGOs (77%) agree that ICT had a high impact on advancing development initiatives. The distribution is very similar to the last question and does indicate that ICT is becoming pervasive in assisting NGOs in the delivery of their core functions rather than just administrative functions.

## ICT impact on advancing training and educational initiatives

Once again, there is high agreement on this question. Most NGOs (77%) agreed that ICT had a high impact on advancing training and educational initiatives.

## ICT impact on advancing capacity building initiatives

There is again broad agreement on this question, with 57% indicating that ICT had a high impact on advancing capacity building initiatives.

## ICT impact on advancing internal staff development

73% of NGOs agreed that ICT had a high impact on advancing internal staff development.

## Summary of ICT impact on NGO abilities

In terms of advancing capacity building initiatives, NGOs found that ICT had a greater impact in this area. However, as a whole these are objectively low proportions. The impact of ICTs never exceeds the 20% mark. ICT investment ultimately needs to focus on running the NGO better. But it also needs to aid NGOs to achieve the purpose of their very existence, which is to further their aims and plans of action, and help those who need their assistance.

## ICT industry opportunity

There is ample opportunity highlighted in this report for the ICT industry to engage with NGOs in furthering the aims of the Indian NGO sector. There is a clear similarity between the NGO and SME environments, as indicated in this report. Such similarities provide the ICT industry with a template to work with when approaching the NGO sector.

# Conclusion

NGOs continue with their uptake of advanced ICT applications, where they see clear value. They are now starting to embrace advanced functions found in cellphones, and other advanced web-based methodologies and applications. There is, however, a fairly underdeveloped ecosystem of suppliers and providers, of these solutions on these technologies that focuses on the NGO sector.

NGOs have indicated that they are successfully leveraging current technology, yet they acknowledge that they are not achieving the full potential of such technology. They are in certain areas, disillusioned with certain technologies, such as Open source software. Most NGOs say that ICT has had a major impact on their ability to advance human rights,

NGOs are increasingly utilising technology, as many are saying they are in a Basic stage of technology adoption. Almost half (49%) regard themselves as merely Average. There is thus great potential for pushing advanced usage of technology among NGOs. The opportunity exists for far greater adoption of technology within the NGO sector with 23% of NGOs in the average to below average Technology adoption levels.

Increased social media usage can assist NGOs in many ways and can be put to good effect. One such area which is being utilised more and more by NGOs is for advocacy, awareness campaigns, internal communication, and fund raising. This would also be in keeping with current world trends as seen with top NGOs in different parts of world.

# Chapter 9
## New Solutions for Better Working

## In Industries

As you can see, ICT is a broad and fast-changing subject. We can discuss the use of ICT in some of the following industries where it works towards increasing efficiency, enabling flexibility, improving livelihood, and promoting economy compared to the legacy systems:

(i)     Manufacture

(ii)    Public

(iii)   Transport and Logistics

(iv)    Life sciences

(v)     Energy and utilities

(vi)    Finance and insurances

(vii)   Retail and media



(a)     Government and public sector :

    (i)     Guarantee Public security: Safe city (intelligent video surveillance, trunk communication, emergency command center, cyber police, e-ID)

    (ii)    Improve govt. efficiency: E-government (government communication and collaboration, office automation, portal and hotline, digital city management )

    (iii)   Enhance public service :

        a.   E-education ( remote education cloud, digital campus)

        b.   E-health ( public health cloud, Digital hospital)

    (iv)    Promote Economy growth : ipark ( Smart building, hosting service)

(b)     Transport : Smart Transport :

    (i)     Road : Automatic fare collection ( AFC)

    (ii)    Hybrid :All in one card

    (iii)   Train: Intelligent transport system

    (iv)    Flight :Wireless ground services, in-flight communication, in-flight entertainment

    (v)     Ship: Ground service communication, cargo management system

(c)     E-finance :

    (i)     Virtual teller machine

    (ii)    Mobile payment solution

    (iii)   Multimedia call center

    (iv)    Telepresence

    (v)     Telephony bank

    (vi)    One stop branch access

(d)     Energy and utility:

    (i)     Smart grid ( generation, TX, Distribution and consumption )

    (ii)    Smart Energy

# Chapter 10
## Need of ICT in Heath

ICT Adoption in Healthcare Industry comprises of the implementation of various ICT solutions which facilitate efficient, enhanced & high quality healthcare operations. Some of the healthcare industry segments are hospital & infrastructure, biotechnology & pharmaceuticals, medical equipments & supply, diagnostic & pathology etc. Rapid growth in the healthcare industry and need for overcoming the rural-urban gap in service availability will drive the ICT adoption in healthcare industry in India.

The report begins with an introduction section consisting of background of the study related to Information and Communication Technology (ICT), healthcare industry and its ICT requirements.

The development of medical and health undertakings increases requirements on hospital informatization. Hospitals' traditional information systems lag behind the growing needs.

The Department of Health has posed unprecedented requirements for information from hospitals to focus on informatization. The Department of Health is responsible for promoting and guiding all affairs related to regional health care informatization. This trend has driven many hospitals to propose digitalized hospitals.

The standards of a digitalized hospital vary with medical treatment units. According to targets proposed by various hospitals, its understanding of the industry, and customer requirements, the summarized basic features for digital hospitals as follows.

(a)     **Humanization:** Digital hospitals are in line with people-oriented and patient-centered principles. Human concern is embodied in every system detail for ease of business operations.

(b)     **Integration:** A digital hospital consists of different sub-systems of the sectors in the hospital. These sub-systems are integrated in an organic and unified way to avoid information islands.

(c)     **Intelligentization:** Digital hospitals are intelligentized, which reduces artificial operations, increases the degree of automation, and adds auxiliary support.

(d)     **Paperless environment:** The application of electronic prescriptions, electronic patient records, electronic application forms, electronic reports, and the electronic office has gradually achieved a paperless office.

(e)     **Filmless:** A medical imaging system is used to establish the following sectors, thus enabling a filmless model for clinical diagnosis and management: digital reading centers, and diagnosis workstations in radiology departments; digital reading rooms in clinical centers, and workstations for doctors; digital reading centers, consultation centers, and teaching centers for the entire hospital.

(f)     **Wireless network:** Use wireless devices such as notebook PCs and tablet PCs, PDAs, wireless patient trackers to realize ward inspections, warehouse management, and patient tracking. This means that services are bound by neither time nor space.

## Analysis of Establishing the e-Health Solution

Informatization is crucial to managing and developing modern hospitals. Modern management features allround, granular, and timely calculation and retrieval of large amount of data based on a scientific model. Modern hospital management can achieve few operations without an information system. This is because routine tasks, such as calculating medical expenses and total cost accounting, are highly complicated.

Certain tasks that cannot be manually completed previously can be achieved through informatization, which contributes to optimizing efficiency, patient flow, and patient satisfaction.

The medical industry is of high risks. All hospitals seek to minimize risks. Paramedics approach their jobs as required through the accuracy and thoroughness of the information system to reduce risks by using e-Health technologies.

## Background of e-health Projects:

## Existing Circumstances

Economic and social progress has led to stricter demands for health care. Problems with medical services are becoming more evident. These problems include:

Inefficient communications between different offices result in failure to share information and low efficiency

Long patient queues at peak appointment times, Pharmacy management covers daily activities, prescription accuracy, and medicine distribution. Manual accounting degrades the efficiency, and mistakes occur often

Difficult financial management. Costs such as out- patient clinic charges, in-patient, administration, and nursing are included in cost accounting. Lengthy manual handling processes do not suit the development of hospitals.

Difficult patient management. It is time-consuming for doctors to inquire about related information due to the increasing number of patients.

Difficult material management. As the scale of hospitals increases, the optimization of facility operations and management requires new management method for the easy and efficient use of medica facilities.

## General Introduction to the e-Health Solution

The e-Health solution includes software and IT architecture.

Software is mainly divided into the hospital information system (HIS), the laboratory information management system (LIS), the picture archiving and communication system (PACS), the radiology information system (RIS), and the epidemic reporting system. The logical relation diagram among systems is as follows:
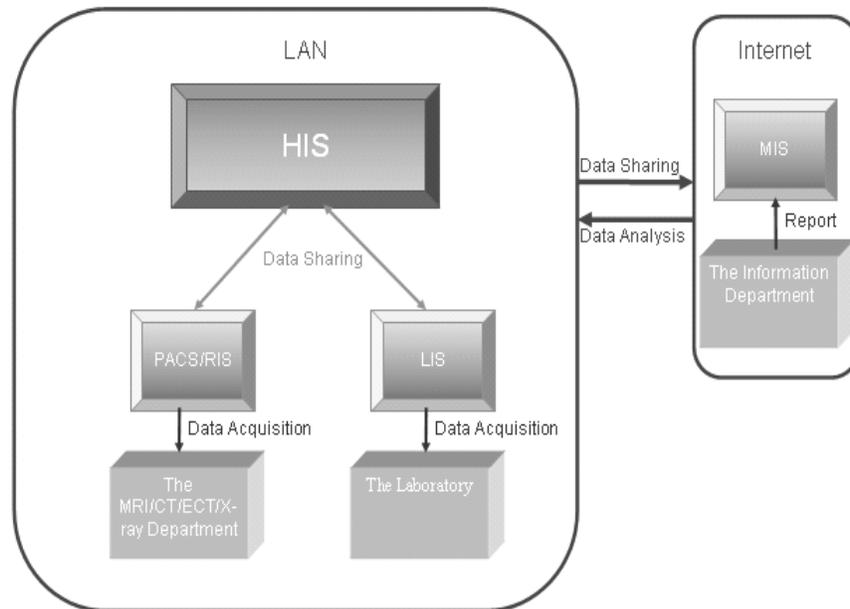
The following sections will discuss the functions of software sub-modules according to the classification of sub-modules.

The IT architecture is divided into five parts: storage area, security area, network area, administration area, and computing area. The networking schematic diagram is as follows:
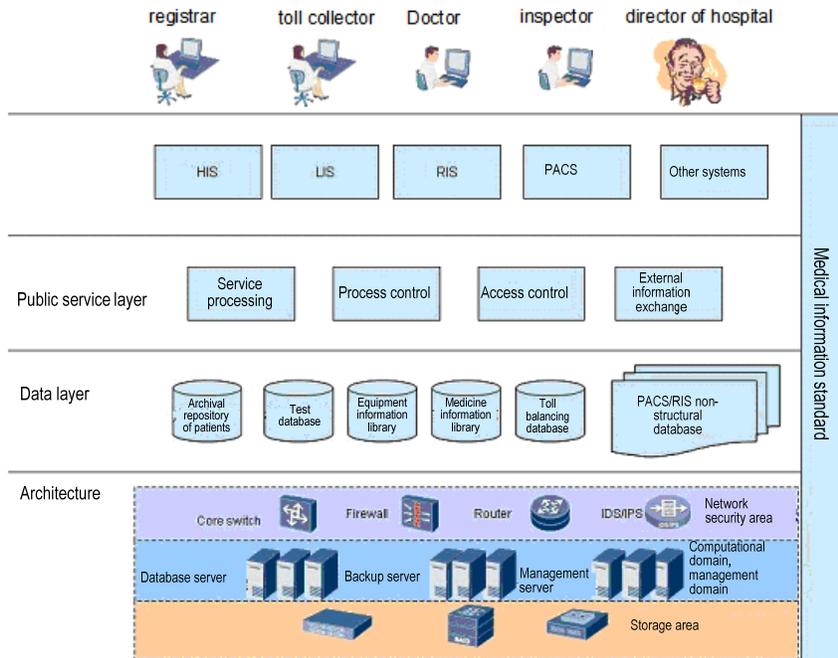


E-Health solution is designed based on the computer network platform and hospital service software (exclusive of electronic medical equipment) to solve the preceding problems. The solution has the following advantages:

*User-friendliness and reliability of the software*: The design of the system software fully takes each user and characteristics of users into consideration. It provides a simple and convenient interface suitable for all operators. The friendly operating system is usable by operators after some simple training or self-study.

*System stability and maintainability:* The system is well structured. Each component functions independently so that partial modifications do not affect the whole system, or the structure and functions of other components. Mature and reliable technologies or components of the product management system are used to manage large modules.

*Network security*: The hospital information system collects and processes large amounts of data every day. Any failure of the system will cause inestimable loss, so the system must be highly secure. The design of the system utilizes mature, stable and reliable software technologies to ensure safe and long-term running of the system.

*Data integrity*: Data integrity faults are divided into two types: run-time errors of programs due to absence of integrated test after program design and data transmission errors generated by the network or hardware equipment. You can avoid the first type of errors through accurate design and careful programming and by carefully handling the service process, standardizing the interface format, and comprehensively testing the system. You can avoid the second type of errors by building a network lab to simulate the field environment, testing the performance pressure of the system, analyzing the network traffic, evaluating performance, and assessing hidden risks to optimize system configuration and ensure reliability during delivery.

*Network scalability*: A series of Huawei data communication products fully protect customer investments in terms of scalability. Each product design takes upgradability and scalability into consideration. Meanwhile, the design balances customer investment and usability and reserves considerable scalable space and convenient upgrades for each product. Customers are able to upgrade the system or expand capacity with small amounts of investment in a short time.
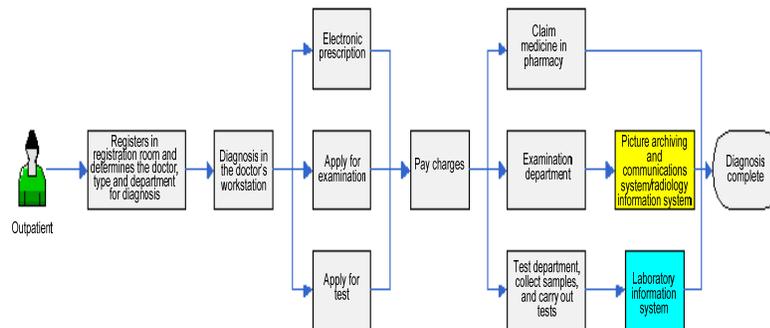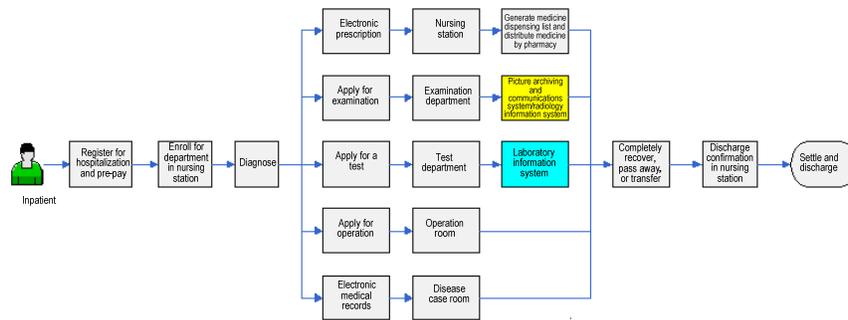
# Application Scenarios of the e-Health Solution

## Service System of a Large Hospital

A large hospital provides medical and health service across regions, provinces, cities, and even the entire country. It is a medical prevention technology center with capability of medical treatment, education and scientific research, and with more than 1000 hospital beds and 5000 outpatients each day. It is equipped with a mature computer network and a complete set of large-scale medical equipments.

The IT architecture construction in a large hospital can be patient-centered to computerize the flow concerning patients in hospital, strictly control the management criterion and operation process, form a modern management mode, and feedback accurate information to unify work of the whole hospital. It offers scientific foundation for policy decision and ensures deep-going management for hospital leadership. Meanwhile, hospital informatization construction improves efficiency and quality of hospital work, and decreases work intensity of clerical work to enable hospital workers with more energy and time for patients.

The application modules of a large hospital are as follows:
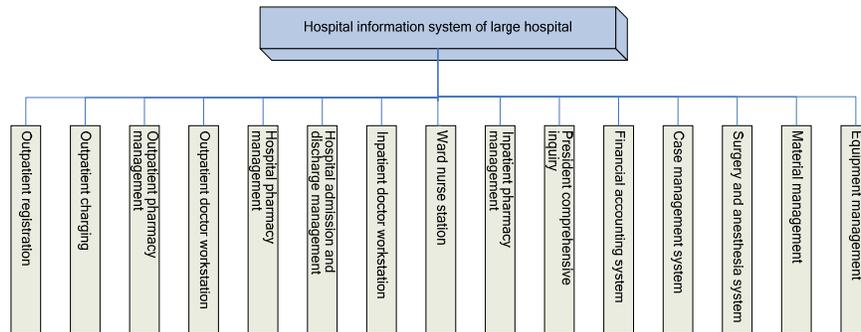
A large hospital uses LIS, PACS, and RIS. Therefore, it is recommended that all functional modules of the HIS, including the HIS, LIS, PACS and RIS interfaces, be used. Therefore, the HIS includes outpatient service and in-patient as well as finance, material equipment, president decision inquiry, and case management auxiliary modules to meet the needs of routine work of a large hospital.

A large hospital is provided with a complete set of test equipment so the LIS is required. The functions of the LIS are simple so all sub-modules are needed. The configuration is shown in the following figure.
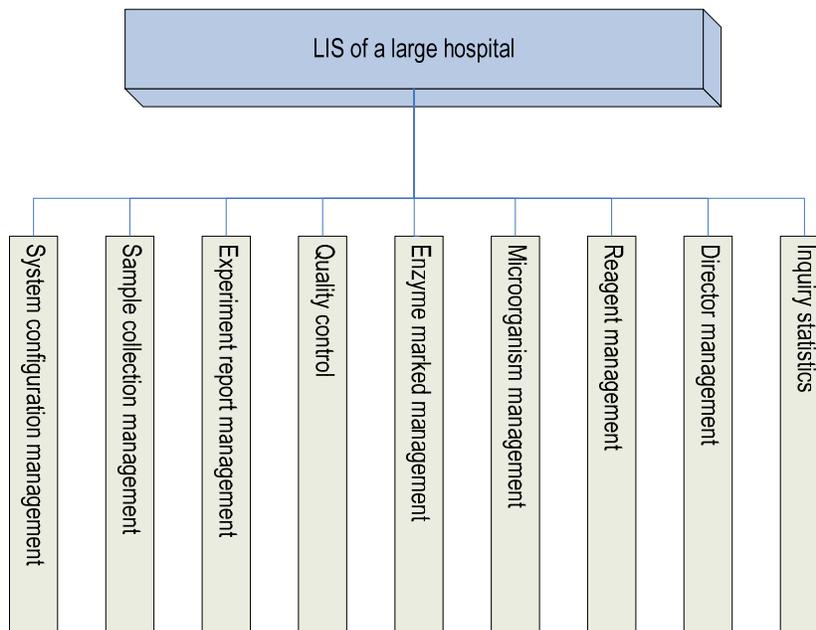
A large hospital is provided with a complete set of checking equipment including CT, ECT, MRT, DR, and DSA. It is recommended that the PACS/RIS be used to assist the work of the radioscopy department. The functions of the PACS/RIS are simple so all sub-modules are needed. The configuration is shown in the following figure.
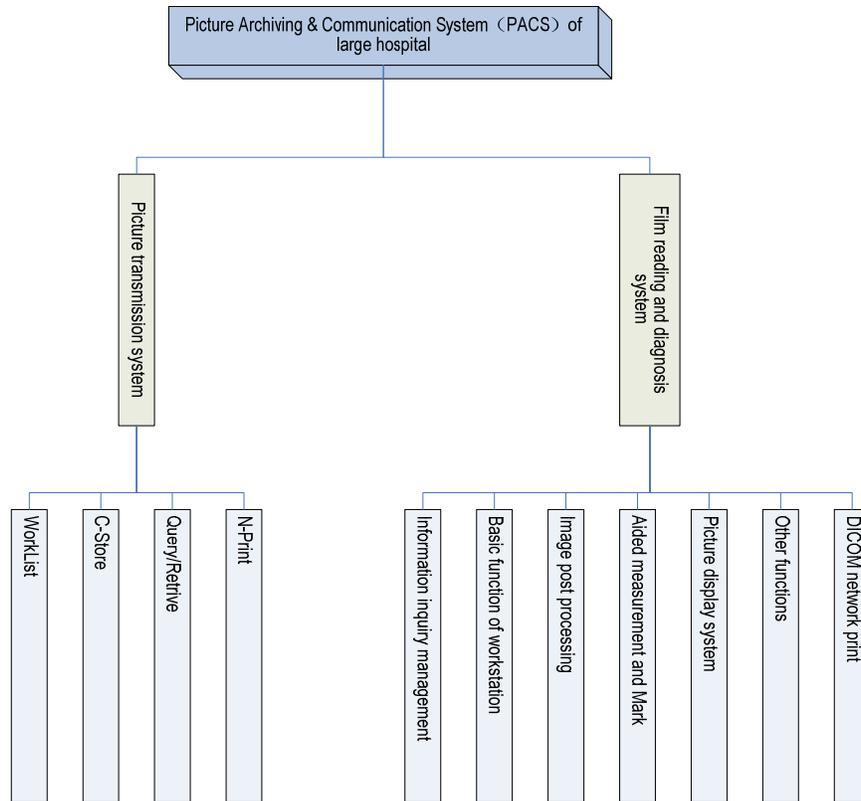


## Features of the e-Health Solution

To address the problems present in current e-Health solutions, the e-Health solution focuses on the design of the computer network platform and hospital business software (exclusive of e-Health devices). The e-Health Solution has the following advantages:

*Ease of use and reliability of the software*: The system software design takes into considerations the features of all user types, and provides user-friendly interfaces. The operators can learn all the operations through simple trainings or even self education.

*Stability and maintainability of the system*: Because the system is well-structured and each of the components has clear missions, partial modifications do not affect the whole system or the running status of other parts. The mature, reliable technologies and product management system enable easy management on all the components of the whole system.

**Security of the network**: The hospital information system collects and processes a massive amount of data every day, and a system failure would cause huge losses. This poses high requirements on the reliability of the system. The system is supported by mature, stable, and reliable software technologies, which guarantee the stable running of the system.

**Integrity of the data:** Data corruptions or losses may be caused by program running errors arising from the fact that some programs were not thoroughly tested in the design stage, or by data transmission errors that occur when the network or hardware fails. To prevent program errors, we can do the following: design the system and write the programs carefully, refine the service procedures, specify the interface formats, and run thorough tests on the system. To prevent data transmission errors, we can simulate network scenarios in a network lab and run pressure tests on the system to fully analyze the traffic and calculate the system performance, find out potential weaknesses in the system, and optimize the system configurations. In this way, the reliability and stability of the system can be ensured before delivery.

**Scalability of the network:** The system is designed as an open platform that allows different products of different vendors to be integrated into the system, which helps you achieve high system performance with minimum investment, and lowers the development and maintenance costs of the whole system. Having taken into consideration the growth of businesses in the future, the system design is kept simple, and the function modules are relatively independent, which is good for system expansion.

## The Key Challenges of ICTs Integration in Health

The integration of ICTs in Health systems may face various challenges with respect to policy, planning, infrastructure, Managebility, Awareness, capacity building and financing, as it is a capital sensitive project.

ICT-enhanced E-heath projects require clearly stated objectives, mainly from government, for moderenisation of their hospitals as private sector ones have already started doing the same but the ordinary people are yet to utilize those utilities.

Mobilization of resources and political commitment of the concerned bodies discusses issues such as analysis of current practices and arrangements, identification of potential drives and barriers, infrastructure and capacity building to be considered in the formulation of policy and planning.

Policy makers, then, need to know the potentials of ICTs in applying different contexts for different purposes.

Other challenging points at the level of policy and planning are identification of stakeholders and harmonization of efforts across different interest groups, the piloting of the chosen ICT-based model, and specification of existing sources of financing and the development of strategies for generating financial resources to support ICT use over the long term.

The infrastructure challenges that may exist are absence of appropriate buildings and rooms to house the technology, shortage of electric supply and telephone lines, and lack of the different types of ICT systems is the skill-gap of people implementing it. For instance, Doctors/Nurses and others involved in health industry need professional development to gain skills with particular applications of ICT.

English is the dominant language in many of the software, while English language proficiency is not high in many of the developing countries. And this is one barrier in the integration of ICT to hospitals mainly in local hospitals.

Another great challenge is the financing. ICTs in Health programs require large capital investment and developing countries need to predict the benefit of ICT use to balance the cost relative to the existing alternatives.

## Summary and the Way Forward

This review article attempts to answer questions on the role of ICTs in Health, existing promises, limitations and the challenges of its integration in Health systems. Information communication technologies are influencing all aspects of life including health.

In other words, ICT is becoming more appropriate in the realization and implementation of the emerging pedagogy of constructivism

ICTs, despite their known limitations, are believed to be beneficial in this regard. The computer and the internet are especially useful The reviewer of this article strongly recommends the mainstreaming of ICT utilization (particularly the computer and internet) in Health systems at levels. Therefore, policy makers and all concerned should evaluate and recognize the role of ICT in Health industry in order to work for the effective functioning of this technology in their systems.

# Chapter 11
## Need of ICT in Education

Now we come to the Role of ICT in education. Information communication technologies (ICT) at present are influencing every aspect of human life. They are playing important role in work places, business, education, and entertainment. Moreover, many people recognize ICTs as catalysts for change; change in working conditions, handling and exchanging information, teaching methods, learning approaches, scientific research, and in accessing information. Therefore, this review article discusses the roles of ICTs, the promises, limitations and key challenges in their integration into education systems. The review attempts in answering the following questions:

(1)     What are the benefits of ICTs in education?

(2)     What are the existing promises of ICT use in education systems of some developing countries?

(3)     What are the limitations and key challenges of ICTs integration into education systems? The review concludes that regardless of all the limitations characterizing it, ICT benefits education systems to provide quality education in alignment with constructivism, which is a contemporary paradigm of learning.

## Introduction

ICTs are making dynamic changes in society. They are influencing all aspects of life. The influences are felt more and more at schools. Because ICTs provide both students and teachers with more opportunities in adapting learning and teaching to individual needs, society is, forcing schools to aptly respond to this technical innovation. Tinio[8], states the potentials of ICTs in increasing access and improving relevance and quality of education in developing countries. Tinio further states the potentials of ICT as follows:

ICTs greatly facilitate the acquisition and absorption of knowledge, offering developing countries unprecedented opportunities to enhance educational systems, improve policy formulation and execution, and widen the range of opportunities for business and the poor. One of the greatest hardships endured by the poor, and by many others, who live in the poorest countries, is their sense

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[8] Tnio-expert researcher

of isolation, and ICTs can open access to knowledge in ways unimaginable not long ago.

In other words, [9]ICTs have revolutionized the way people work today and are now transforming education systems. As a result, if schools train children in yesterday's skills and technologies, they may not be effective and fit in tomorrow's world.

This is a sufficient reason for ICTs to win global recognition and attention. For instance, ICTs are dependable tools in facilitating the attainment of one of the Millennium Development Goals (MDGs), which aims at achievement of universal primary education by the year 2015. Kofi Anan[10], points out that in order to attain the goal of Universal Primary Education by the year 2015, we must ensure that information and communication technologies (ICTs) unlock the door of education systems. This indicates the growing demand and increasingly important place that (ICTs) could receive in education. Since ICTs provide greater opportunity for students and teachers to adjust learning and teaching to individual needs, society is compelling schools to appropriately respond to this technical challenge.

Even though ICTs play significant roles in representing equalization strategy for developing countries, the reality of the digital divide- the gap between those who have access to, and control technology and those who do not - make a huge difference in the use of ICTs. This means, that the introduction and integration of ICTs at different levels and various types of education is the most challenging undertaking. Failure to meet the challenges would mean a further widening of the knowledge gap and deepening of existing economic and social inequalities among the developed and the developing countries.

Thus, the purpose of this review article is to discuss the benefits of use of ICT in education, in the enhancement of student learning, especially in the light of experiences of some countries, in order to encourage policy makers, school administrators, and teachers pay the required attention to integrate this technology into their education systems. In so doing, it highlights the benefits of ICT in education, existing promises, and the limitations and challenges of integration into education systems.

## Operational definition of terms

Information Communication Technologies (ICT) in this review article refers to the computer and internet connections used to handle and communicate information for learning purpose.

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[9] Reference Watson
[10] Former UN general secetery

**E learning:** is a learning program that makes use of an information network- such as the internet, an intranet (LAN) or extranet (WAN) whether wholly or in part, for course delivery, interaction and/or facilitation.

Web-based learning is a subset of e-learning and refers to learning using an internet browser such as the moodle, blackboard or internet explorer.

**Blended Learning:** refers to learning models that combine the face-to-face classroom practice with e-learning solutions. For example, a teacher may facilitate student learning in class contact and use the moodle[11] (modular object - The Role of Information communication) to facilitate out of class learning.

**Constructivism[12]:** is a paradigm of learning that assumes learning as a process. Individuals "construct" meaning or new knowledge based on their prior knowledge and experience. Educators also call it the emerging pedagogy in contrast to the long existing behaviourism view of learning.

**Learner- centred learning environment:**  is a learning environment that pays attention to knowledge, skills, attitudes, and beliefs that learners bring with them to the learning process where its impetus is derived from a paradigm of learning called constructivism. In the context of this article, it means students' personal engagement to the learning task using the computer and or the internet connection.

## The Benefits of ICT in Education

The use of ICT is making a major difference to the learning of students and to teaching approaches. Schools in the Western World have invested a lot for ICT infrastructures over the last 20 years, and students use computers more often and for a much larger range of applications. Several studies reveal that students using ICT facilities mostly show higher learning gains than those who do not use. For instance, research [13]finding across United States showed that:

Students who used computer tutorials in mathematics, natural science, and social science score significantly higher on tests in these subjects. Students who used simulation software in science also scored higher. The findings also indicated that primary school students who used tutorial software in reading scored significantly higher on reading scores. Very young students who used computers to write their own stories scored significantly higher on measures of

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[11] Tool for e-learning with LMS ( Learning management system) facility

[12] (Johassen, 1991).

[13] Research by Kulik's

reading skill. Moreover, students who used word processors or otherwise used the computer for writing scored higher on measures of writing skill.

Furthermore, the use of ICTs in education also shifts the learning approaches. There is a common belief that the use of ICTs in education contributes to a more constructivist learning and an increase in activity and sense of greater responsibility among students. This limits the role of the teacher to supporting, advising, and coaching students rather than merely transmitting knowledge. The gradual progress in using computers changes from learning about computers, to learning computers, and finally to learning with computers. The following questions act as bases for teacher education:

(1)     How can the theoretical ideas be tested in practice?

(2)     What does practice say back to these theoretical ideas?

(3)     How is useful negative feedback obtained?

(4)     What might be substantive talking points about the new processes? What is practical from a classroom perspective?

(5)     What does talking about the new say about the nature of existing technology? Is it adequate?

(6)     What scaffold is needed for the next stage?

On the other hand, teachers' reluctance to adopt innovations need to be seen in the context of existing technology and commitments. Fullen (1989) cited in Watson (2001) states that change or improvement can happen at schools if teachers understand themselves and are understood by others. For instance, many teachers are currently not in a position to make informed judgements on ICTs to support their teaching goals. Clearly a variety of factors still do make using ICT in the curriculum problematic (Watson, 2001). Because of this, the influence of ICT did not bring about revolutionary changes at schools. For instance, the National ICT survey in the Netherlands shows that most primary-school students use computers less than once a week and there are still many secondary school teachers who do not use ICT at all (Volman, 2005). Most often, they use computers for drill-and-practice and word processing.

In recent years, however, there has been a growing interest in learning how computers and internet can be utilized optimally to improve effectiveness and efficiency of education at all levels and in both formal and non-formal settings. As there is a shift in theories explaining learning processes, ICTs become handmaiden for learning activities. Voogt's (2003) description of the major roles, distinguished ICTs as an object for study, an aspect of a discipline or a

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profession, and a medium of instruction. As a medium of instruction, ICTs are fit to realize and implement the emerging pedagogy of constructivism (Davis, 1997; Office of Technology Assessment, 1995; Panel on Educational Technology, 1997; Watson, 1996) in Voogt (2003). Moreover, Voogt (2003) differentiated between traditional learning setting and constructivist approaches. The former considers learning as transmission of knowledge to students, which is the sole responsibility of the teacher. On the other hand, the constructivist approach considers learning as authentic and learner centred. ICT, the computer for example, is a great help in the constructivist approach, where one can design simulated and individualized learning environments to students. ICTs are exerting impacts on pedagogical approaches in the classrooms. Their contribution to changes in teaching practices, school innovation, and community services is considerable.

A research review by Kozma suggests three significant concerns of consideration regarding ICTs impact on education.

Firstly, student outcomes such as higher scores in school subjects or the learning of entirely new skills needed for a developing economy.

Secondly, we should consider teacher and classroom outcomes such as development of teachers' technology skills and knowledge of new pedagogic approaches as well as improved attitudes toward teaching.

Finally, one has to consider other outcomes such as increased innovativeness in schools and access of community members to adult education and literacy.

The table below presents comparison of the traditional pedagogy and the emerging pedagogy of constructivism that fits to the use of ICT (particularly the computer and internet) to increase student involvement in learning.

Emerging pedagogy is the name given to the new view of constructivist learning when compared to the relatively long existing behaviorist view of learning.

Tinio describes each of the pedagogic aspects in the table above in terms of implication for ICT use as follows.

**Active learning:** ICT-enhanced learning mobilizes tools for examination, calculation and analysis of information in order to provide a platform for student inquiry, analysis and construction of new information. The learners, therefore, learn as and when they do appropriate work on real-life problems in-depth. Moreover, ICT makes the learning less abstract and more relevant to their life situations. In contrast to memorization-based or rote-learning, that is the feature of traditional pedagogy, ICT-enhanced learning promotes increased learner

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engagement. ICT-enhanced learning can also be 'just-in-time' learning that the learners choose what to learn when they need.

**Collaborative learning:** ICT-supported learning encourages interaction and cooperation among students, teachers, and experts regardless of where they are. Apart from modelling real world interactions, ICT-supported learning provides opportunity to work with students from different cultures, thereby helping to enhance learners' teaming and communication skills as well as their global awareness. It models learning done throughout the learner's lifetime by expanding the learning pace to include not just peers but also mentors and experts from different fields.

**Creative learning:** ICT-supported learning promotes the manipulation of existing information and the creation of real-world products rather than the duplication of received information.

**Integrative learning:** ICT-enhanced learning promotes a thematic integrative approach to teaching and learning. This approach eliminates the artificial separation between the different disciplines and between theory and practice, which characterizes the traditional approach.

**Evaluative learning:** ICT-enhanced learning is student-directed and diagnostic. Unlike static, text or print-based education, ICT-enhanced learning recognizes the presence of different learning pathways to explore and discover rather than merely listen and remember.

The discussion above clearly elaborates the role of ICTs in facilitating the pedagogy of schools in the information society. As put by (Davis, 1997; Office of Technology Assessment, 1995; panel of Education Technology, 1997; Watson, 1996) in Voogt (2003), ICT is becoming more fitting to realize and implement the emerging pedagogy of constructivism. Nevertheless, an International study by Pelgrum and Anderson (1999) in Voogt (2003) shows a major obstacle for ICT integration in education – the difficulty of integrating computers and internet into classroom practices. Teachers' lack of competence and enthusiasm for using computers in the instructional processes also contribute to the difficulty.

However, in order to improve, and make optimal use of ICTs, changes in the pedagogic approaches and classroom strategies as well as integrating ICT in teacher training and staff development practices accompanied by teacher motivation schemes are imperative.

The following functions of ICT in education are generally identified.

**ICT as object.** It refers to learning about ICT. Mostly organized in a specific course, what is being learned depends on the type of education and the level of

the students. Education prepares students for the use of ICT in education, future occupation, and social life.

**ICT as an 'assisting tool**. ICT is used as a tool, for example, while making assignments, collecting data and documentation, communicating, and conducting research. Typically, ICT is used independently from the subject matter.

**ICT as a medium for teaching and learning.** This refers to ICT as a tool for teaching and learning itself – the medium through which teachers can teach and learners can learn. It appears in many different forms, such as drill and practice exercises, in simulations and educational networks.

**ICT as a tool for organization and management in schools.** Examples of ICT use in Education Systems of Developed Countries: Most of the developed countries have applied ICTs in the 1980s to the level of K- 12 education for a variety of reasons, which are still valid. Some of the reasons are as follows:

A new society requires new skills ICTs are increasingly coming to pervade every aspect of life (work, learning, leisure, and health). Because ICTs are excellent tools for information processing, the new generation needs to become competent in their use, should acquire the necessary skills, and therefore must have access to computers and networks while at school.

Schools are information and knowledge holding institutions. Therefore, ICT should be fundamental information management tool at all levels of an educational system, from classroom to ministries.

A Quest for Quality learning Schools should profoundly revise present teaching practices and resources to create effective learning environments and improve life-long learning skills and habits in their students. ICTs are versatile, and The Role of Information communication Fisseha Mikre powerful tools that can help in this purpose and should therefore be present in every classroom, library and teacher room.

Nevertheless, so far ICTs have not provided any large-scale breakthrough in learning improvements even though there are still promises with great potential.

Developed nations are using ICT in their education systems. For instance, in the United Kingdom, 'rising of standards' of teaching and learning has become intertwined with the use of ICTs. As the UK Minister for Education and Employment states, using digital technology for improving the delivery of education has enormous potential to raise standards and increase employability. To realize this, number of computers in schools is increased from time to time. "In 1980 an initiative placed one computer in every secondary school; two years

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later there were 16. In 1990, the average number of pupils per computer in secondary schools was 18; by 1998, it was eight. The Minister refers to this '' moving schools into an information age'' As Watson puts it.

We are world leaders in ICT at schools, recognizing its vital importance to the future of all pupils. The figures show clearly the advances we have made in the field. It is an investment, not only in our children and in their lives in the 21st century, but in our country's future as well.

The use of computers at an early age helps students learn ICT skills that help as tools in the education process. For example, 77% of Swiss students reported using a computer several times a week to prepare their courses and assignments. Only 3% reported never using a computer for course preparation. As indicated in the OECD (2002) document, the average number of students per computer is an indicator of students' accesses to new technologies. As some data from OECD (2002) shows, the percentage of students with access to computer varies from 25% in Italy to 90% or more in Canada, Finland, and New Zealand.

Computer use also varies between students of primary and secondary schools, with the later generally having greater access. In recent years, the number of students per computer has been decreasing in the countries mentioned above.

**Implications of ICT**-Enhanced Education for Policy and Planning:

There is a common belief that ICTs have a significant contribution to make to bring about changes in teaching practices, school change and innovations, and community services.

Thus, policy makers and project leaders should think in terms of input factors that can work together to bring about the right impact of ICT in education. Matching the introduction of computers with national policies and programs related to changes in curriculum, pedagogy, assessment, and teacher training is more likely to result in greater learning by students and other achievements.

OECD's international survey (2002) of upper secondary schools in 17 countries reveals computer availability for students; use of ICTs by teachers; ICTs activities as a part of student assignment; the role of ICTs in teaching and learning; staff development; co-operation with other schools and organizations; and obstacles to using ICTs in schools, and found great variations among the countries with respect to the mentioned variables.

OECD's Education Committee meeting for instance endorsed a proposal for a new activity on ICT known as "Policy Challenges for Education". *The meeting Ethiop. J. Educ. & Sc. Vol. 6 No 2* intended to identify and evaluate what

education policy makers might do to better use ICTs in achieving improved educational outcomes. As cited in the OECD Planning Meeting Agenda and Issue Paper (2002: 3), the structure of activity focuses on two broad and related questions as follows:

1.  What policies are required to ensure that investment in ICTs leads to educational outcomes? This tries to understand how ICT can contribute to greater access to learning, to higher quality teaching, and to improved and more equitable learning outcomes.

2.  What impact is ICT having upon the operation of educational institutions and upon educational policymaking? This tries to reflect on issues such as institutional frameworks for school management, the regulatory structures for educational institutions, and teachers' work arrangements.

The need for linking ICT to education policies requires recognition. In reflecting the importance of technologies, education policies should focus on the following major points:

(1)  Education policies have to reflect alternate and new teaching paradigms that ICT can offer in terms of providing a more effective, relevant, and flexible mode of learning for the underprivileged and the general masses.

(2)  Policies must take into account the retraining of teachers incorporating use of ICTs in education. Teachers should skilfully redesign learning environments so that students can transfer their newly-gained ICT skills to other applications to use in an ICT-rich environment.

(3)  Most educational policies reflect the need for ICT infrastructure but they leave out the need for local educational content. The development of instructional content-ware remains a neglected area, affecting investments in hardware and resulting in a heavy economic and educational loss.

(4)  The focus of developing countries should be on how they use ICTs to compensate for the factors that are lacking in education, namely, well-trained teachers and the resources to pay for expensive equipment. The task is to concentrate on technological alternatives that, at low cost, bring to students the imagination and creativity of a few excellent teachers.

### Promises of ICT Use in Developing Countries

*The World Links program:* The World Links program is a good initiation in the form of a project, originally managed by the World Bank to place internet-connected computers in secondary schools and train teachers in Africa, Latin

America, the Middle East, and South and Southeast Asia. The goal of the program is to improve educational outcomes, economic opportunities, and global understanding for youth using information technology and new approaches to learning. Services provided by the program include:

- Feasibility studies and consultation on connectivity solutions and telecenter management,

- Internet connectivity for secondary schools in developing countries,

- School-to-school partnerships, as well as regional and global partnerships with public, private, and non-governmental organizations,

- Teacher's professional development on issues of technology in the context of innovative pedagogy, and The Role of Information communication

- Workshops for policy makers on coordination of policies and implementation strategies

With the help of the World Links program, many countries are now using ICTs as ways of providing teachers with new skills and introducing innovative pedagogies in the classroom. For example, teachers in Chile acquired familiarity with computers for professional (eg. student marks, parent reports) and out-of-classroom tasks (e.g. searching for educational content on the web and lesson-planning activities). The program also provides 200 hours of teacher training that include an introduction to ICT, use of the internet for teaching and learning, use of tele-collaborative learning projects, integration of ICTs into the curriculum and teaching, and innovative pedagogical approaches. Because of this, a majority of teachers and school principals report that teachers trained with computer and teaching skills gained positive attitudes about technology and about teaching. Moreover, some Asian countries such as India, Thailand, and Indonesia realized the importance of ICT integration with their education policies. They are also investing in ICT infrastructure for schools and creating network links of education institutions.

On the other hand, developed countries are now making online education, smart schools, and virtual universities more of a norm. Developing countries are also fast catching up. For instance, the Government of India announced an ambitious program titled 'Vidya Vahini' that is to create computer laboratories with facilities like internet access, an online library, academic services and web-casting across 60 thousand schools in the country in 2003.

Vietnam has also invested in the development of a computer-based information network system for education called Education Network (EdNet) and improve

computer facilities at educational institutions. EdNet is the country's first step towards developing a computer based information network system for education.

Thailand has also launched School Net, which has connected 4758 schools throughout the country. School Net Thailand is using the internet to improve the overall standard of education in the country by reducing the gap in quality of education between schools in urban and rural areas.

Even Pakistan has invested 5.18 million US dollars to provide connectivity across universities, secondary and primary schools in 2003.

ICTs make curriculum implementation learner-centred with a self-learning environment that enables the student customize his/her own learning experiences. In this respect, Malaysia initiated the concept of smart school, a learning institution with objectives to foster self-assessed, self-paced, and self-directed learning through the application of ICTs.

The Sri Lankan Government also runs several key initiatives connecting 92 education centres across provinces, regions and sectors to the ministry, and developing computer-training centres at 8 hundred selected schools.

In Namibia, in integrating ICT into education and training systems, issues of access to the local and global knowledge and information was found to be important. For this, the education and training sector created the ICT policy for education to enhance the use and development of ICT for education and training. Hence the five distinct development areas for the use of ICT mentioned in the policy are:

(1)     Investigation and development of appropriate ICT solutions,

(2)     Deployment of ICT,

(3)     Maintenance and support of ICT,

(4)     ICT literacy, and

(5)     ICT integration.

The policy document also describes the provision and advantages of ICT as follows:

ICT provides a great deal of advantage in the delivery of equitable quality education thereby providing an opportunity to improve the lives of our people. The need to use new technologies to raise the quality and efficiency of education cannot be overemphasized. It is imperative that we expose our children, parents, and teachers to ICT to improve the quality of education and technical proficiency of our human resources, thus leading to increased productivity and accelerated

development. We must also prepare our citizens to adapt to the global economy and participate in electronic commerce.

In addition, we must provide our children with a greater understanding of other peoples and cultures, thus defending our renewed legacy of peace and tolerance. Moreover, some of the ICT benefits to the classroom and the education process mentioned in the document are:

ICTs,

- Offer the opportunity for more student-centred teaching,

- Provide greater opportunity for teacher-to-teacher and student-to student communication and collaboration,

- Give greater exposure to vocational and workforce skills for students,

- Provide opportunities for multiple technologies delivered by teachers,

- Create greater enthusiasm for learning amongst students,

- Provide teachers with new sources of information and knowledge,

- Prepare learners for the real world,

- Provide distance learners countrywide with online educational materials

- Provide learners with additional resources to assist resource-based learning.

Furthermore, the document wants ICTs to cover all the technologies used for holding and communicating information and their use specifically in education with overall policy goals of:

- Producing ICT literate citizens,

- Producing people capable of working and participating in the new economies and societies arising from ICTs and related developments,

- Leveraging ICTs to assist and facilitate learning for the benefit of all learners and teachers across the curriculum,

- Improving the efficiency of educational administration and management at every level from the classroom, school library, through the school and on to the sector as a whole,

- Broadening access to quality educational services for learners at all levels of the education system, and

- Set specific criteria and targets to help classify and categorize the different development levels of using ICT in education.

Tanzania introduced the use of computers in business and felt the need to train people to operate them. In response to this, Higher Education Institutes introduced courses in computer science and information technology. Several private training institutions were also established to train computer literacy. In addition, the Tanzanian Government planned and started the supply of computers to secondary schools. By the year 1997 the Ministry of

Education and Culture had issued a syllabus for computer studies in secondary schools, The WoredaNet and SchoolNet in Ethiopia.

In the case of Ethiopia's education system, ICT use, particularly the computer and The Role of Information communication internet is very much limited though there is a clear policy direction.

Awareness creation and preparation to use computer and the internet for learning seems promising. The promise founded itself on the launching of WoredaNet, an e-government communication and the ICT strategy, which are the major enablers for the fast development of ICT use in the country (Hare, 2007). The public sector and the education sector have begun to benefit from Woredanet and the ICT strategy though the accomplishment is not to the perceived standard. The national education initiative with implementation strategy of ICT use in education and the subsequent action plans, for example, has come up because of the WoredaNet program.

The implementation strategy of the country, also called ICT for development plan number 6, has three broad categories as described by (Hare, 2007). These are (1) the Ethiopian National School Net initiative that is aimed at networking 500 schools and the utilization of ICTs to facilitate the teaching-learning process at primary, secondary, technical and vocational schools, (2) the National ICTs in Higher Education Initiative that focuses on orchestrating ICTs within universities, colleges, and research institutes to facilitate student learning, research activities, and community services, and (3) the national ICT Education, Training and Awareness Initiative that promotes ICT awareness and literacy, adult education and lifelong learning, and virtual distance learning in the country.

Furthermore, the implementation strategy recognizes ICT as a potential for widening access to education and facilitation for education delivery and training at all levels. Nevertheless, despite the efforts and the strategies in place, there are challenges to coordinate the implementation of the initiatives. For instance, if we consider the second initiative, very few courses from institutes of technologies in universities are in the Moodle (modular object- oriented dynamic learning environments) platform that employ the computer and internet connections to enrich student learning via blended design.

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The most challenging condition for implementing ICT strategy in Ethiopian schools is inadequacy of existing infrastructures. Even though integrating ICT use in the teaching-learning process was given due recognition in the implementation strategy, only about 40 percent of schools in the country have computers, most of which are in Addis Ababa, causing a rural-urban divide in equity and access for quality education.

Moreover, those schools, which have computers, experience limited or low access to internet connections. On the other hand, lecturers in higher learning institutes are expected to adopt computers and the internet as a teaching tool. However, computers, network infrastructures and connections are not compatible with the size of enrolled students and existing demands. In addition, teachers do lack the required skill to match the technology (e.g. Computers and the internet) with innovative pedagogies that benefit students' learning. Many teachers do not have the necessary IT skills and feel uncomfortable, nor do they have the specific training needed to be able to use the new resources in the classroom. There is still little attempt, that is why the number of students in higher learning institutes using computers and the internet is insignificant. Students' skill inusing the technology is also a serious challenge that needs the attention of the institutes. Thus, these have implications for the future, to work hard for the benefit of students learning from the use of technologies.

## Limitations of ICT use in Education

ICT as a modern technology that simplifies and facilitates human activities is not only advantageous in many respects, but also has many limitations. Many people from inside and outside the education system, think of ICT as "Panacea" or the most important solution to school problems and improvements. However, many conditions can be considered as limitations of ICT use in education. The limitations can be categorized as:

- teacher related,

- student related, and

- technology related.

All of them potentially limit the benefits of ICT to education. Teachers' attitude plays an important role in the teaching-learning process that utilizes computers and internet connections. Although teachers' attitude towards use of these technologies is vital, many observations reveal that teachers do not have clarity about how far technology can be beneficial for the facilitation and enhancement of learning. Of course, some teachers may have positive attitudes to the technology, but refrain from using it in teaching due to low self-efficacy, tendency

to consider themselves not qualified to teach with technology. In this respect, Bandura (1986) describes self-efficacy as "individual's opinion of capabilities to organize and perform courses of actions to achieve particular types of performances." Moreover, as identified by Brosnan (2001), attitude, motivation, computer anxiety, and computer self-efficacy are factors affecting teachers' use of computers in their lessons.

Teacher resistance and lack of enthusiasm to use ICT in education may also be another limitation. Furthermore, many teachers may not have the required IT skills and may feel uncomfortable; they may not have the training needed to use the technology in their teaching. Unless teachers develop some basic skills and willingness to experiment with students, ICT use in education is in a disadvantage (Brosnan, 2001).

On the other hand, the limitation of ICT use in education is related to student behaviour. Appropriate use of computer and the internet by students have significant positive impact on students' attitude and their achievement.

Nonetheless, it is very common to observe limitations related to student behaviour. Students tend to misuse the technology for leisure time activities and have less time to learn and study. Yousef and Dahmani (2008) described online gaming, use of Face Book, chat rooms, and other communication channels as perceived drawbacks of ICT use in education, because, students easily switch to these sites at the expense of their study. Internet access at home, for instance, may be a distraction because of chat rooms and online games, reducing the time spent in doing assignments and learning (Kulik, 1994). Therefore, the impact of ICT on student learning strongly depends on its specific uses.

If ICT is not properly used, the disadvantage will overweigh the advantage. For example, while students use the internet, it may confuse them by the multiplicity of information to choose from. As a result, the teacher spends much time keep students off from websites unrelated to the learning content. as a measure of caution, it is important to identify the major limitations of ICT use in education as related to student behaviour. The various literature in the area, identify the following

The Role of Information communication – limitations of ICT use in education as related to student behaviour:

- Computers limit students' imagination,
- Over-reliance on ICT limits students' critical thinking and analytical skills,
- Students often have only a superficial understanding of the information they download,

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- Computer-based learning has negative physical side-effects such as vision problem,

- Students may be easily distracted from their learning and may visit unwanted sites,

- Students tend to neglect learning resources other than the computer and internet,

- Students tend to focus on superficial presentations and copying from the internet,

- Students may have less opportunity to use oral skills and hand writing,

- Use of ICT may be difficult for weaker students, because they may have problems with working independently and may need more support from the teacher.

Another limitation of ICT use in education is technology related. The high cost of the technology and maintenance of the facilities, high cost of spare parts, virus attack on software and the computer, interruptions of internet connections, and poor supply of electric power are among the technology related limitations of ICT use in education.

## The Key Challenges of ICT Integration in Education

The integration of ICTs in education systems may face various challenges with respect to policy, planning, infrastructure, learning content and language, capacity building and financing. ICT-enhanced education requires clearly stated objectives, mobilization of resources and political commitment of the concerned bodies. Tinio (2002) discusses issues such as analysis of current practices and arrangements, identification of potential drives and barriers, curriculum and pedagogy, infrastructure and capacity building to be considered in the formulation of policy and planning. In addition, it is wise to specify educational goals at different education and training levels as well as the different modalities of ICT use that can facilitate in the pursuit of the goals. Policy makers then, need to know the potentials of ICTs in using different contexts for different purposes.

Other challenging points at the level of policy and planning are identification of stakeholders and harmonization of efforts across different interest groups, the piloting of the chosen ICT-based model, and specification of existing sources of financing and the development of strategies for generating financial resources to support ICT use over the long term.

The infrastructure challenges that may exist are absence of appropriate buildings and rooms to house the technology, shortage of electric supply and telephone

lines, and paucity of the different types of ICTs. Because of this, one needs to deal with infrastructure related challenges before the planning of ICTs' integration in education systems. With respect to challenges of capacity building, we have to develop competencies of teachers and school administrators for the successful integration of ICT in the education system. In fact, one impeding factor of ICTs integration in education systems is the gap in skills of people implementing it For instance, teachers need professional development to gain skills in particular applications of ICT, integration into existing curricula, curricular changes related to its use, changes in teacher role, and on underpinning of educational theories such as constructivism/or student-centred learning. Because of this, any attempt of ICT integration in education should parallel teachers professional development.

The school leadership also plays a key role in the integration of ICT in education. Lack of support from the school administration is also a big challenge. Thus, for the effectiveness of ICT integration, administrators must be competent and have a broad understanding of the technical, curricular, administrative, financial, and social dimensions of ICT use in education.

Furthermore, learning content and language also challenge the integration of ICT in education. Content development is a critical area that educators overlook. In integrating ICT in education, we have to care for the relevance of the learning content to the target groups. With respect to language, English is the dominant language in many of educational software, while English language proficiency is not high in many of the developing countries, and this is one barrier in the integration of ICT into education.

Another great challenge is the financing. ICTs in education programs require large capital investment and developing countries need to predict the benefit of ICT use to balance the cost relative to the existing alternatives. Potential sources of money and resources for ICT use programs suggested are grants, public subsidies, fund raising events, in kind support from volunteers, community support, revenues earned from core business, and revenues earned from ancillary activities.

Overcoming the above-mentioned challenges may help education systems benefit the most from this technology.

# Chapter 12
## Summary and Way Forward

NGOs continue with their uptake of advanced ICT applications, where they see clear value. They are now starting to embrace advanced functions found in cellphones, and other advanced web-based methodologies and applications. There is however, a fairly underdeveloped ecosystem of suppliers, and providers, of these solutions on these technologies that focuses on the NGO sector.

NGOs have indicated that they are successfully leveraging current technology, yet they acknowledge that they are not achieving the full potential of such technology. They are in certain areas, disillusioned with certain technologies, such as Open source software. Most NGOs say that ICT has had a major impact on their ability to advance human rights,

NGOs are increasingly utilising technology, as many are saying they are in a Basic stage of technology adoption. Almost half (49%) regard themselves as merely Average; there is thus great potential for pushing advanced usage of technology among NGOs. The opportunity exists for far greater adoption of technology within the NGO sector with 23% of NGOs in the average to below average Technology adoption levels.

Increased social media usage can assist NGOs in many ways and can be put to good effect. One such area being utilised more and more by NGOs is advocacy, awareness campaigns, internal communication, and fund raising. This would also be in keeping with current world trends as seen with top NGOs in different parts of world.

This review article also attempts to answer questions on the roles of ICTs in education and health, existing promises, limitations and the challenges of its integration in education systems/Health. Information communication technologies are influencing all aspects of life including education/Health.

They are promoting changes in working conditions, handling and exchanging of information, teaching-learning approaches and so on.

One area in which the impact of ICT is significant, is education, and same can be possible in case of health, although private sector is gromming in this area, NGO and government need to catch up. ICTs are making major differences in the teaching approaches and the ways students are learning. ICT-enhanced learning

environment facilitates active, collaborative, creative, integrative, and evaluative learning as an advantage over the traditional method.

In other words, ICT is becoming more appropriate in the realization and implementation of the emerging pedagogy of constructivism that gives greater responsibility to learning. Several surveys are showing that ICT use in education systems of developed nations has comparatively advanced than ICT use in education systems of developing nations. In addition, the major promises of ICT use in education systems of developing countries focus on training teachers in new skills and introducing innovative pedagogies into the classrooms, investing on ICT infrastructure for schools and creating networks among educational institutes, improving overall standard of education by reducing the gap in quality of education between schools in urban and rural areas, initiation of smart school with objectives to foster self-paced, self-assessed, and self-directed learning through the applications of ICTs, and developing ICT policy for education and training.

What will be the way forward then? There is a consensus that the development of any country depends upon the quality of education programs offered to citizens and health status of that country. If we develop these two sectors i.e. if a citizen is healthy and educated, it will be a building block in the development of any country.

ICTs, despite their known limitations, are believed to be beneficial in this regard. The computer and the internet are especially useful in enhancing impact performance and achievement. Moreover, their usefulness is more apparent in the 21st century, The reviewer of this article strongly recommends the mainstreaming of ICT utilization (particularly the computer and internet). Policy makers, educators and all concerned should evaluate and recognize the roles of ICT in order to work for the effective functioning of this technology.

# Sample Sheet of one of the Email-Feedback Forms

FEEDBACK FORM – NEED OF ICT IN NGO's/NPO 's

NGO /NPO Name :

Respondant name :

Contact No :                                                   Email ID :

1. Head Office Location : a) city b) Village ………………………….

2. Scope : a) National b) regional ……………………….

3. Area of working ……………………………………………a) Community development b) Social services c) Child welfare,d) Community training e) Human Rights f)HIV/AIDS care g) Counselling h) Formal education i) Enviroment j) job training h) health i) Advocacy j) Awareness k) Economic Development l) Rural development m)Adult Basic Education n) Others

4. Size and scale ……a) No of branches ……….. b) Full time staff…………..c) Part time staff …………. d) Volunteer staff

5. Role of correspondents ….a) Finance Manager/Administrator b) CEO c) Manager d) Others e) ICT managers f) Media g) Fundraisers h) Website handlers i) others

6. Number of desktops …….. Number of laptops ………….. numbers of servers

7. Operating system used …..a) Windows b) Linux c) Other………. d) Don't know

8. How is your computer connected? a) Wired b) Wireless c) Don't know

9. Which software is used in office? a) Microsoft Office b) Open Office c) Word Perfect d) Other ……. e) Don't know

10. Which telecom services are you using? a) Landline phone b)mobile phone c) Fax d) internet e) VOIP f) E-mail g) None

11. Do you think technology helps NGOs function better ? a) strongly agree b) agree c) neutral d) not agree e) no comments

12. How much ICT ( technology) is adapted by your NGO a) Very basic b) Somewhat basic c) Average d) Somewhat advanced e) Advanced

13. Do you use accounting software? a) Yes b) No. If yes, which accounting software are you using? a) Tally b) SAP c) Excel d) other……(Please specify)

14. Do you use any CRM ( customer relationship management ) software ? a) Yes b) No, if yes please specify …………….

15. Who provides support for your technologies a) Outsourced b) in-house admin. c) None d) Combination of above e) Vendor/Retailer directly

16. Who advises you on your technology needs a) Consultant b) Don't know c) Non-profit colleague d) friend e) System integrator f) Family member g) The internet h) Local supplier i) other

17. If security is provided,what type of security is there? a) Virus protection b) firewall c) hardware firewall d) Spam filter e) content filter f) No measures in place.

18. Which type of internet connection do you have? a) ADSL b) Dial up c) lease line d) ftth e) Ethernet f) ISDN g) wi-fi h) Wimax i) NONE

19. Are you aware of Mobile internet technology? a) GPRS b) Edge c) 3G d) LTE

20. Are you satisfied with your internet services? a) Very satisfied b) satisfied c) average d) poor

21. Are you satisfied with your computer? a) Very satisfied b) satisfied c) average d) poor

22. Are you satisfied with your office software? a) Very satisfied b) satisfied c) average d) poor

23. Are you satisfied with your internet costs? a) Very satisfied b) satisfied c) average d) poor

24. Are you satisfied with your computer hardware cost? a) Very satisfied b) satisfied c) average d) poor

25. Which software do you use? a) Free b) Pirated c) Purchased d) Don't know

26. For what purpose do you use your website? a) Supply information b) Marketing c) Campaigning d) Collecting information e) Branding f) Fundraising g) Selling reports h) Selling goods/service i) No website

27. Do you publish information on internet? a) No b) Blogging c) Video d) Documents e) Photographs f) e-mail

28. Which social website doyou use a) Facebook b) LinkedIn c) Twitter d) Others…..e) None

29. Do you raise money through website? a) No b) Yes

30. Which cell phone features are used by you or your NGO staff? a) SMS b) website c) blue tooth d) multimedia e) GPS f) Video on mobile g) Other…………

31. Do you think Email is important to be in touch with others? a) No b) Yes

32. Are you able to access mail once out of office? a) Yes b) No

33. Do you think E-mail helps you remain in touch with office even if you are on move? a) Yes b) No

34. Do you think you can respond to an emergency on phone? a) Somewhat b) Agree c) Strongly agree d) No

35. How do NGOs stay in touch with stake holders? a) E-mail b) Fax c) Voice calls d) Letters e) SMS f) Web g) Messaging h) Face-to- Face meeting

36. Which technology do you think you will use in future to be in touch with stakeholders in another 2-3 years? a) E-mail b) Fax c) Voice calls d) Letters e) SMS f) Web g) Messging h) Face-to Face meeting

37. How can NGOs.be educated on technology a) Formal training b) Self-help guides c) Collegue guidance d) Ad-hoc training courses e) Online training

38. How much percentage of revenue do you spend on your IT and tech a) Don't know b) None c) 1% d) 2%-5% e)5%-10% f) More than 10%

39. Do you think government is making efforts to improve usage of ICT? a) Strongly agree b) Agree c) Neutral d)Don't agree e) No comments

40. Do you think given a chance you will improve your organization technology in future ICT? a) Strongly agree b) Agree c) Neutral d) Don't agree e) No comments

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