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Education for the Base of the Pyramid People (BOP) Using Voice Internet E-Learning

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Abstract

The need for education, especially for the Base of the Pyramid people (BOP) is very important from various aspects including their survivability, Economic, Social, Cultural and other developments, and minimizing the Digital Divide & Rich-Poor gap. Since many BOP are illiterate, live in rural areas where schools or educational institutions are scarce and cannot afford to go to schools, educating such population is a daunting task. In this paper, we describe a practical affordable solution to educate BOP using Voice Internet e-Learning that uses an Intelligent Agent and user's voice using any phone. Our approach uses both informal and formal learning including learning how to read or write using natural language. We emphasize on practical informal learning on Innovation and Entrepreneurship to ensure immediate and sustainable significant impact on Economic, Social and Cultural developments, along with creation of an enormous "Resource ".

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1. Introduction

The need for education, especially for the BOP (Base of the Pyramid people) to eradicate poverty, minimize rich-poor gap, improve health, improve quality of life and more is obvious. Education is the key for economic, social, cultural and other growths. Education empowers a person and helps to become proactive, gain control of the life and broaden the range of available options [4]. Education is recognized as a basic human right. Education is the key for innovation, entrepreneurship, productivity improvement and resource creation.

In general, education is more important for women and children as they are less likely to receive medical services, clean water, sanitation and other services. Education is equally important for the people with various disabilities to help them become more independent, getting employed, avoid social exclusion and getting entertained. And, of course, education is good and important for all other types of people.

However, to have access to education, access to the Internet is almost a must in this information age. Hence, it is important that everyone can access the Internet easily and economically. It is needless to mention the importance of accessing the Internet for other needs including employment, economic, social, cultural & other developments, and more. Accessing the Internet in a practical and affordable way, and having e-Learning capability are even more important for BOP as they either do not have easy access to educational institutions or they cannot easily afford to attend an educational institution. In [1] and [2], we have described how Voice Internet can provide Internet access to everyone and help bridge the Digital Divide in a practical way by solving the key issues related to the existing approaches in bridging the Digital Divide. We argued that **existing approaches to bridge the Digital Divide are good but not sufficient to completely bridge the Digital Divide**. We then showed a more practical solution using "**Voice Internet**" to provide the benefits of the Internet to over 5 billion people (out of about 7 billion people in the world) who have some access to a phone. In [3] we emphasized that for the **BOP**, we would need to provide access using an ubiquitous device (like a simple phone), with a natural user interface (like Voice), without a requirement to be literate (no need to know how to read or write; rather use talking and listening), use existing content on the Internet (avoiding to re-write with another language like WML), and start with simple most desired services (like e-services).

What's next after Internet access is provided and Digital and Language Divides [1] are bridged from connectivity standpoint? Well, we would need to utilize the access to the information to knowledge, use knowledge to drive innovation & entrepreneurship to finally drive economic, social, cultural and other developments with increased world peace. Education is a key component to develop knowledge from the information. It is also a key component for innovation and entrepreneurship. And, of course, it is a key component to more easily get employed as well as increase productivity. Thus, access to the Internet and Education goes hand to hand.

It is important to note that although education lowers or help eradicate poverty (as stated above), there is no strict causal relationship in a macro sense [4]. In fact, one key reason for this is lack of emphasis on informal education and education on innovation & entrepreneurship.

In this paper, we describe a practical affordable solution to educate BOP using Voice Internet e-Learning that uses an Intelligent Agent. Our approach includes both informal and formal learning including learning how to read or write using natural language. We emphasize on practical informal learning on Innovation and Entrepreneurship to ensure immediate and sustainable significant impact on Economic,

Social and Cultural developments along with a valuable "Resource Creation", and thus show a better causal relationship between education and eradication of poverty. Section 2 provides a short description of existing efforts. Section 3 describes a method to effectively bridging the Digital and Language Divides as these are strongly related to effective e-Learning. Section 4 describes our solution. Section 5 emphasizes on innovation and entrepreneurship along with the need for a well integrated approach to ensure effective implementation helping Global Development, and Section 6 provides conclusion.

2. Existing Approaches and Critical Issues

Many organizations around the world have been very active in providing education to the poor. Such organizations include the United Nations, World Bank, Governments, NGOs, Foundations, Non-profit entities, Corporations, Universities and Research Institutions. They usually provide help in various ways including special summer classes, special courses, equipments, books and other related materials. In addition to teaching via face-to-face classes, some of these organizations also provide various help with e-Learning. These efforts are well aligned with the following conclusion

"There is no way the world can succeed in eradication of poverty if the developing world is not part of the knowledge creation, its dissemination and its utilization to promote innovation"

made by both the United Nations Millennium Project Task Force and the World Bank after conducting some good research.

Since traditional classroom based education for the poor is expensive, although very important, we focus here more on e-Learning.

One good source describing various efforts on conventional education as well as e-Learning education for the poor is [4] where authors provide a good summary of the current efforts and some good recommendations in moving forward with e-Learning. All such recommendations are geared towards mainly literate people, use of existing e-Learning framework and existing approaches to access the Internet, which is mainly dominated via using a computer. While such recommendations are great and should be continued, these would not provide a practical affordable solution to the poor for the following key reasons:

1. Poor (BOP) do not have access to computers.
2. Most of the BOP are illiterate.
3. Most rural areas do not have Internet Access.
4. Most e-Learning courses are formal courses geared for the literate people.
5. Most e-Learning courses are in English.
6. No noticeable focus on Innovation and Entrepreneurship.

Thus, we would need to address the problem by focusing on the following:

A. Effectively address the issues of bridging the Digital and Language Divides to ensure easy access to the Internet through a ubiquitous device like a simple phone.
B. Use voice and natural language for interaction as many BOP are illiterate.
C. Focus mainly on "informal education" as BOP would need something affordable, simple and quick that would help them much sooner than going through some formal degrees or certificates.
D. Focus on some good "Automated Method" to ensure that content delivery, use, teaching and learning are simple, natural and easy.

E. Focus on Innovation and Entrepreneurship as these are critical to expedite and sustain development.

We believe our proposed solution using **Voice Internet e-Learning** would effectively meet above needs, and hence would be a good, affordable and practical solution as well supported by the existing users of Voice Internet.

3.   Effectively Bridging the Digital and Language Divides

The existing approaches of bridging the Digital Divide can be broadly classified into **three groups**:

(a) by providing computers or low cost simple computers or computer like devices to people who do not have one.
(b) by providing personal devices like PDAs and cell phones with good size display screen.
(c) by using TV with a set-top box.

In [1] and[2] we have argued that existing approaches to bridge the Digital Divide are important and will minimize the Digital Divide but are not sufficient to truly bridge the Digital Divide, mainly for the following reasons:
1. Connected computers represent about 15% of the total phone population. Besides, for many people (especially at BOP), learning and using a computer is difficult.
2. Personal devices like a cell phone with good size screen or PDA are great devices to communicate via voice or text with small contents. But these are not good devices to do computing or to access the Internet. The key reasons are:

     a. difficult user interface because of small screen and small keypad. In fact, these devices are getting smaller, in general, whereas our eyes and fingers are not.
  b. The content is limited as one would need to re-write the content in another language like WML (Wireless Markup Language) in case of cell phone viewing; or the content needs to be manually scrolled in case of a PDA.

  c. Visual access makes such devices difficult in an eyes busy-hands busy situation like while driving.

  d. Many people, especially, in the developing world do not know how to read or write. So, a visual display based access would not be very useful to such population.

     Accessing the Internet via a TV and set-top box has not been very successful yet. However, it has a great promise. With TV becoming more interactive device, people getting more and more familiar with the Internet and more attractive content becoming available through digital TV and IPTV, Internet access via TV shows great potential. The cost issue and fear of learning how to use a computer will be significantly minimized for many people. However, most of the other key issues mentioned for computer or mobile phone based access will still apply – like digital TV will still be beyond reach by many people at the base of the pyramid, learning how to use complex features will still be there via a complex remote control.

 Voice Internet overcomes the difficulties mentioned above with existing approaches:

- no need to buy a special device (thus allowing easy & affordable access to many more people)

- no need to deal with small screen or small key pad as users basically talk and listen

- much easier to learn as learning how to use a phone is much simpler than learning how to use a computer or personal device

- no need to re-write the content in another language. There are over 3 billions of websites on the Internet. Re-writing all of them would be very expensive and hence not practical

-no requirement to know how to read or write

The **other key challenge that Voice Internet overcomes** is the **"rendering"** problem. The Internet was designed with visual access in a large display device in mind. Thus, all the information is laid out in a manner that attracts our eyes but not ears. **Rendering or converting such information into short, precise, easily navigable, meaningful and pleasant to listen to content** is a very hard problem that Voice Internet has overcome. These key features of rendering are very important as when listening, one does not have time to listen to everything on a page, would like to move around easily and quickly and make sure that content heard is the content that was desired.

An **Automated Attendant (also called an Intelligent Agent, IA)** is used to perform the "rendering" function. IA performs rendering by

(a) automatically generating important information of the page, called, "Page Highlights", presenting them in a small amount of information at a time that one can easily follow

(b) finding appropriate as well as only relevant contents on a linked page selected by a Page Highlight, assembling the relevant contents from a linked page, and presenting them

(c) and providing easy navigation.

Rendering allows users to easily navigate within and between pages using simple voice commands or keypad entries. The Intelligent Agent is capable of learning user preferences, to continually improve ease of access and use over time.

Rendering is achieved by using algorithms similar to the algorithms used by sighted users. The key steps of rendering are done using the information available in the visual web page itself and employing appropriate algorithms to use all such information including text contents, color, font size, links, paragraph, amount of texts and meaning of the words. Some language processing algorithms are also used to further refine the rendering, navigation and filling of on-line forms (Form Filling). This is similar to how the brain of a normal sighted person renders information from a visual page by looking into the font size, boldness, color, content density, link, meaning of titles/labels, and then selecting a topic, going to the desired page and then reading only the relevant information on the desired page. Form filling is done by presenting forms as Form Page Highlights and also creating appropriate questions, taking the text/voice inputs from the user and then filling and submitting the form.

Thus, a user can seamlessly access any content on the Internet, interact with any forms and complete transactions like shopping, banking etc. using a simple phone and his/her own voice. Another key feature is that contents can be translated in real time into another language, providing audio access to, for example, English-language web pages for those with limited English language skills, thus bridging the **Language Divide**. A good example of Voice Internet is netECHO® from **InternetSpeech, Inc, a company based in California, USA (www.internetspeech.com).**

Voice Internet is an **enabling technology**. The core technology can be used to develop many new products and services including MicroBrowser (to allow any website content to be automatically and effectively displayed on any cell phone or PDA screen at ease) without the need to re-write the web content in another language, Voice Computer (to allow a user to store, edit and manipulate files etc. on a server via phone call), netTalk (allowing VoIP call using no broadband phone or no broadband connection) and more. In this paper, we extend the Voice Internet Intelligent Agent for effective e-Learning for the BOP.

4. Our Proposed e-Learning Solution for the BOP using Voice Internet

Our e-Learning solution is built on the Voice Internet technology as it addresses some of major issues related to the BOP in providing effective education via e-Learning, namely,

A. Help bridges the Digital and Language Divides in an effective way to ensure easy access to the Internet through a ubiquitous device like a simple phone.
B. Uses voice and natural language for interaction.
C. Renders content into Short, Precise, Easily Navigable and Meaningful content.
D. Users basically talk and listen to the Internet using their voice and hearing.

These key features available in Voice Internet are enhanced with an augmented Intelligent Agent to handle the e-Learning needs. Thus, the **Voice Internet e-Learning Intelligent Agent (VIELIA)** addresses the following additional issues:

E. Focus on some good "Automated Method" to ensure that content delivery, use, teaching and learning are simple, natural and easy.
F. Uses Question and Answer type System Approach in the domain of Interest.
G. Focus mainly on "informal education/courses" as BOP would need something affordable, simple and quick that would help them much sooner than going through some formal degrees or certificates.
H. VIELIA also focuses on "formal" existing e-Learning courses but with better delivery and user interaction.
I. Focuses on Innovation and Entrepreneurship as these are critical to expedite and sustain development.

These additional features are achieved by using better content management, enhanced dialogue design, enhanced rendering, Natural Language Understanding, Q&A approach and an automated way to improve performance over time using some self-learning. **Fig. 1 shows VIELIA** architecture with all major blocks.

5. Focusing on Innovation and Entrepreneurship

As already emphasized, education, especially e-Learning based education is a very important element for BOP. To stimulate real economic growth, "education" needs to be highly emphasized and targeted, especially with "**creativity", "productivity" and "resource" creation** in mind. Creativity will in turn **drive innovation, entrepreneurship and productivity** (and even resources – like discovering new oil reserve, alternate energy…) resulting successful business entities which in turn will create jobs and **drive economy, reducing rich-poor gap**. In a nut shell, the key idea is to use the benefits of getting to the Internet to create valuable resources.

As already emphasized, education needs to be targeted with special focus **on Innovation and Entrepreneurship in both informal and formal setting** (with more emphasis on informal setting to meet the needs of the BOP).

Fostering Innovation:
Education is great and essential but not sufficient to have a great impact by itself. E.g. even after everybody is well educated, most possibly there will be more job seekers than number of jobs. So, education itself will not solve the ultimate goal of having great economic development.

Innovation is a very important element to apply education in a manner it is impactful in solving some key problems in more efficient ways, and thus, help many people and in turn help economic growth. Innovation does not need to be at high level – it can be at all levels. So, there is no need to think that only certain highly educated people can do innovation. In fact, many illiterate people can be very innovative in solving their key problems. This is why we would need to emphasize on both formal and informal education as many people at the base of the Pyramid can become innovative faster using informal education.
Similarly, higher education is the key for innovation at high level. Thus, graduate studies (with special focus on multi-disciplinary education) in key subject areas including science, engineering, medicine, and business are very important. A pure technical innovation may not be effective in producing good results unless there are also innovation in marketing, sales and business development.

Innovation needs to be in almost everything including improving various types of existing systems (transportation, communication, business processes, ..), automating various processes (economic, social,,…), coming up with new product or business ideas (in the local, regional or global contexts), and research. *A well integrated approach addressing all key issues and using a sound business model is needed to ensure effective implementation & helping Global Development [1].*

Fostering Entrepreneurship:
Innovation & Education alone cannot really make things happen unless innovations are implemented using a sound business model. Thus, fostering "entrepreneurship" using innovation is the key to take full advantage of innovation - developing products and services, deploying them to the users, ensuring that such products and services are beneficial to the users & society, and thus helping social, economic, cultural and other developments. These will also help monetize the innovation. Like innovation, entrepreneurship should also be at all levels.

5.1 An Example of How Voice Internet Helps in Education, Innovation and Entrepreneurship
Voice Internet is an important enabling technology that helps in Education, Innovation and Entrepreneurship:
    1. Provides basic farming related education to all farmers via any phone and user's voice.
    2. Provide many Extension services via on-line using any phone.
    3. Helps farmers sell more easily via simple outlets.

4. Help farmers sell via online shopping portals.
5. Help farmers learn how to minimize waste and preserve their produce by converting them into various processed food products.
6. Help farmers to get funding through Voice Internet based Microfinance.

All these help improve the efficiency significantly, make their selling process much easier, minimize waste and increase their ROI (Return on investment). Voice Internet based e-Learning also enables them to move up the food chain and come up with new forms of products and services. Because most of them are illiterate and do not know how to read or write, Voice Internet is a very good affordable, easy to learn and easy to use practical way to help farmers. Once they become more efficient and improve their ROI, it will be easier for them to ensure sustainability and growth.

5.2 Voice Internet based Microfinance Model with Higher ROI & Higher Participation
Voice Internet can successfully use existing microfinance infrastructure to stimulate growth.
The microfinance borrowers borrow a small amount of money and use it to do some business e.g. buying cows and selling milk. One of the main issues is that most borrowers do the same or similar things. Consequently, in a village, most borrowers are likely to sell milk to the same customers. This causes price competition resulting lower margin. In addition, the borrowers would need to return money back to lenders, usually every week, which puts extreme pressure on the borrowers (it is important to note that as a policy, Microfinance model does not provide any business idea, it just provides funding [8]).

Now, let's say that in addition to lending money to the borrowers, we provide specific valuable information via the Internet (e.g. using Voice Internet) that can be used by the borrowers to do some innovative new businesses – e.g. a farmer can do better farming, sell produce with higher margin, learn how to preserve produces & minimize waste and many more. By providing such valuable information and associated training on entrepreneurship & innovation, many people will be able to come up with new compelling business ideas that can provide much higher financial & social **ROI** *(Return on Investment)* *allowing them to keep more for themselves and also providing higher financial return to the lenders.*

As reported in many texts, the interest rate for **microfinance is high** (can range from 30% to 60%). Higher ROI will alleviate this by a substantial amount. Use of the Internet and Voice Internet in processing microfinance would also reduce the management cost, thus lowering the high interest rate. Hence, Voice Internet enabled microfinance would attract many more lenders and borrowers in a positive win-win way – generating more revenues with higher ROI, lowering interest rate and also returning more to the lenders. Accordingly, it would make the microfinance model more successful and will strengthen the whole microfinance infrastructure. Apart from a higher financial ROI, there is obviously a strong Social ROI. And hence, it is a key driving force not just for traditional lenders, but also for many donors and companies to maintain their good corporate citizenship. **And, of course, it would also help Voice Internet significantly as many microfinance borrowers will use the Voice Internet service.**

This will also help the Social Business and Social Entrepreneurship. Thus, **Voice Internet based Microfinance Model will significantly help innovation and entrepreneurship, and in turn will help Economic, Social, Cultural and other developments of BOP. It will also help the investors (rich) as they will get higher ROI.**

6. Conclusion
e-Learning based education *for the Base of the Pyramid (BOP) people is the key for their survival and development. However, we need to ensure that such an e-Learning system meets all the key criteria*

needed by the BOP, namely, Bridging the Digital and Language Divides by using a ubiquitous and affordable device like a simple phone, Use voice and natural language for interaction as many BOP are illiterate, Focus mainly on "informal education" as BOP would need something affordable, simple and quick that would help them much sooner than going through some formal degrees or certificates, Focus on some good "Automated Method" to ensure that content delivery, usage, teaching and learning are simple, natural and easy, and Focus on Innovation and Entrepreneurship as these are critical to ensure development with sustainability and growth.

Our proposed solution using **Voice Internet e-Learning** would effectively meet above needs, and hence would be a good, affordable and practical solution as well supported by the existing users of Voice Internet.

*We believe our proposed approach can create an**, enormous resource from the BOP people who can** then actively participate in driving **global economy***. *This would not only help the base of the Pyramid people to get out of the poverty but would also help top of the Pyramid people who can effectively use such an enormous low cost resource.*
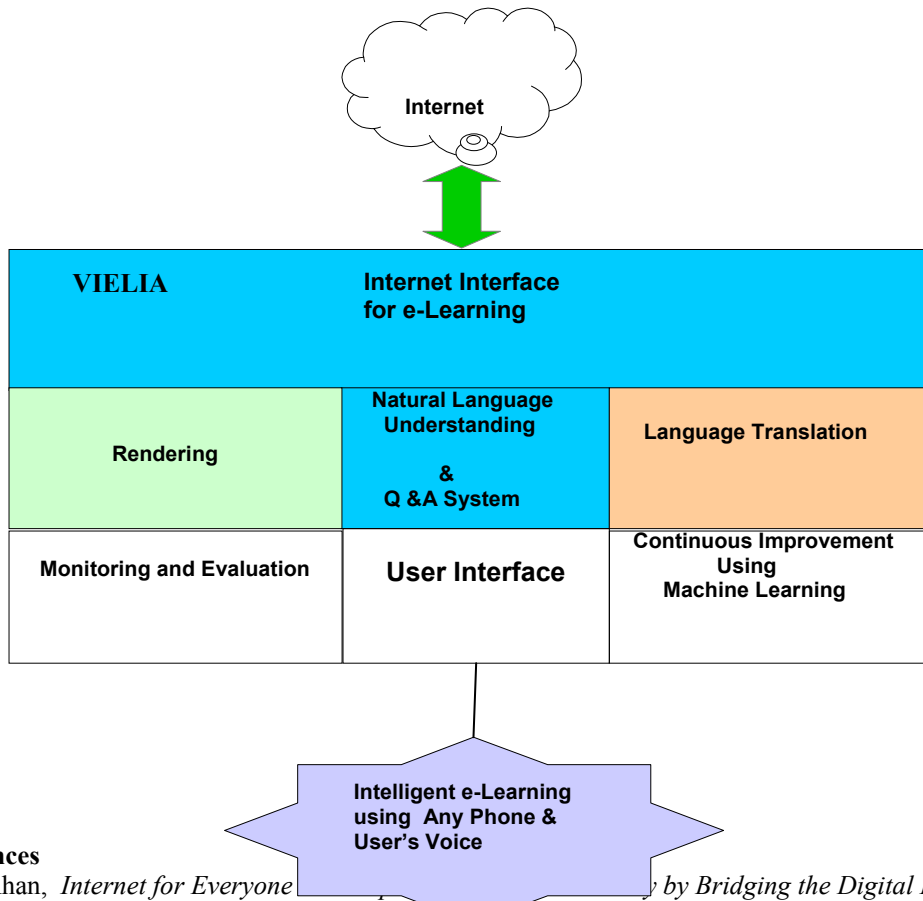
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Fig. 1 Voice Internet based e-Learning Intelligent Agent (VIELIA)

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