

# VillageApps - A platform to educate underprivileged communities in their mother tongue

Ibrahim Ghaznavi, Umar Muneer, Usman Shahid  
Shan Randhawa, Kashif Ali, Tapan Parikh, Umar Saif

Information Technology University  
University of California, Berkeley

{ighaznavi, umuneer, ushahid, srandhawa, umar}@itu.edu.pk  
{kashif, parikh}@berkeley.edu

## ABSTRACT

Illiteracy is one of the biggest development challenges, especially in the developing regions. There are 785M adult illiterates in the world; one in every five people has little or no basic reading skills. Illiteracy poses the following challenges: It limits the ability to understand essential information, it increases unemployment, poverty and it has a negative impact on health.

In this study, we present VillageApps - a framework to educate underprivileged communities in their mother tongue. The paper details the platform, its functionality, and its initial evaluation on a group of 30 school-aged children. Our framework consists of a web and a mobile application; the web application provides an interface to upload content and record its page by page audio translation; the mobile application provides an interface to view each page and simultaneously listen to its audio translation.

## Categories and Subject Descriptors

H.5.2 [User Interfaces and Presentation]: [User-centered design]

## General Terms

Design, Human Factors

## Keywords

ICTD; rural development; computing for development; mobile for development; literacy

## 1. INTRODUCTION

Pakistan's 5.5 million school-aged children do not attend school. In the province of Baluchistan, about half of the chil-

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from [Permissions@acm.org](mailto:Permissions@acm.org).

*ICTD '15*, May 15 - 18, 2015, Singapore, Singapore  
Copyright 2015 ACM 978-1-4503-3163-0/15/05 \$15.00  
<http://dx.doi.org/10.1145/2737856.2737904>.

dren in the fifth grade are unable to subtract two numbers and read a sentence in English [1]. Access to information in rural areas is sparse, and there is an acute shortage of primary-school teachers [9]. The main problems hindering educational activities in rural areas are: poor readability, difficulty in learning a new language, and textual illiteracy. The availability of reading material in a learner's mother tongue can improve reading skills [10].

Information and communication technologies can bridge the knowledge divide by enabling people to learn in their Mother tongue. VillageApps is a platform that provides reading illiterates access to educational content in their mother tongue.

## 2. ICTS FOR INFORMATION DISSEMINATION

This section discusses some existing innovative ICT solutions to spread relevant information to different groups of under-privileged rural communities.

### 2.1 Voice based solution for farmers

Knoche et al [4] use audio to share pertinent information with the illiterate farmers in their local language. The prime motive of this approach is to help farmers adapt to good farming practices by improving access to trustworthy information. It does not have pictorial or video multimedia support to aid the voice content.

### 2.2 Featherweight multimedia

Chu et al [2] combine printed paper brochures displaying categorization of the content, along with the number corresponding to each category, and a multimedia device which takes a number as an input and reads-out-loud its audio representation (in the native language). This approach requires printing equipment and some expertise to create customized information brochures.

### 2.3 Talking Book

Talking Book is a battery powered, portable gadget which stores and plays voice recordings. It disseminates important information created by local experts, to the rural communities in their native language [8]. Information can assist farmers, health care professionals and micro-finance organizations. It can be difficult to explain complex content i.e.

which is not very obvious or which is not already in their routine vocabulary.

## 2.4 Video Viewing Club

David et al [3] use multimedia video(s) to train farmers on complex technical topics. The study improved farmers knowledge of the topics covered in the videos. Some of the farmers complained about the length of the videos. Creation of videos is a complex process that requires specialized professionals. In such a scenario, a user does not have the luxury to proceed at his or her own pace.

## 2.5 Others

Avaaj Otalo - an interactive voice messaging forum for small-scale farmers to disseminate farming knowledge and also ask/answer question on a variety of issues [6]. It is a voice only learning technique for which users need to be familiar with IVR systems. Ramachandran et al proposed the use of mobile-phone videos to train health workers [7]. The video content was created using video clips and still images. As opposed to the video viewing club, it removed the constraint to view a video at a designated community center by enabling health workers to view video content at their home or any convenient location. Molapo et al also proposed a similar learning technique based on mobile phone videos to train health workers in Sierra Leone and Lesotho [5].

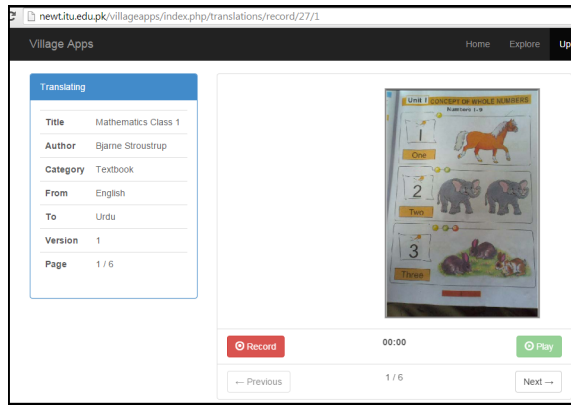


Figure 1: Web Application

## 3. PROPOSED SOLUTION

With some limitations of the existing systems in mind we started our research to devise a platform which can enable learning in native language. The solution is designed to work for illiterate or lesser educated users.

### 3.1 Web application

Our framework consists of a web and a mobile application. The web application, as shown in Figure 1, provides an interface to the volunteer translators to upload(pdf), record and store voice translations of any useful content or book. All the voice-translations are stored page by page. Our application is accessible at: [www.villageapps.org](http://www.villageapps.org). The web application allow the following functionalities:

1. Anyone can explore already translated books;
2. Anyone can upload a pdf content/book;

3. Volunteer translator(s) can look for the books (pending translations);
4. Several translators can pool-in their time to collectively translate a book;

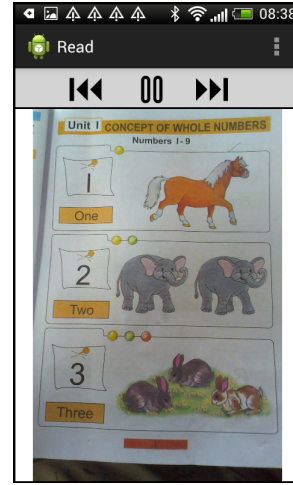


Figure 2: Mobile Application

### 3.2 Mobile application

The mobile application, as shown in Figure 2, enables a user to browse through existing categories such as, education, health, news and weather(can add more). Each category can have a number of items. The mobile application only show books whose complete recordings are available for download. When a particular book is selected it allows following navigations:

1. Move to the next page;
2. Move to the previous page;
3. Play / pause control;
4. Return to category list;

Moving to the next or the previous page automatically plays the associated voice translation of that page. The navigation controls enable learning at user's customized pace.

## 4. INITIAL FIELD-TEST AND SURVEY

We conducted a survey on a group of 30 volunteer children to study the effectiveness of our framework. The volunteers were either early school drop-outs , or never attended school. The volunteers can speak and understand, but can not read Urdu. Using our Web-App a volunteer translator audio recorded page by page translation in Urdu language for the mathematics book of class 1. The book includes basic math lessons like number counting, sorting and comparison. A questionnaire was designed for each maths lesson to study the impact of our application on the learnability of the volunteers. We calculated the percentage of volunteers who answered correctly before and after taking mathematics lessons using our Mobile-App. Some interesting findings are as follows:

MCQs based questionnaire was designed to evaluate the performance of the participants(read-illiterate) in counting,

comparison and sorting mathematics lessons. Each questionnaire was filled with the help of a volunteer reader. The counting questionnaire contain 9 questions, each question has 4 choices; a participant was requested to mark the correct choice for a question for example: Which of the following number if eight (options: 1,8,9,4)? Figure 3 shows the percentage of people who answered correctly. Column 2 and 3 shows the percentage of participants who correctly answered before and after taking the VillageApps mathematics tutorial, respectively. Column 4 shows the percentage difference (or improvement) between before and after tutorial scenarios.

Question#	Before (%)	After (%)	Improvement(%)
1	50	63	13
2	45	45	0
3	10	36	26
4	18	36	18
5	30	53	23
6	33	43	13
7	10	20	10
8	13	26	13
9	7	16	9

Figure 3: Counting results

Figure 4 shows the percentage of people who answered correctly before and after taking the comparison lesson. After VillageApps tutorial there is a percentage improvement for all the questions except 2 comparison questions.

Question#	Before (%)	After (%)	Improvement (%)
1-5 (Ascending)			
6-10 (Descending)			
1	10	36	26
2	27	36	9
3	27	36	9
4	27	27	0
5	20	45	25
6	10	26	16
7	20	26	6
8	10	20	10
9	26	36	10
10	26	26	0

Figure 4: Sorting results

Figure 5 shows the percentage of people who answered correctly before and after taking the sorting lesson. Post VillageApps tutorial there is a percentage improvement for all the questions.

Question#	Before (%)	After (%)	Improvement (%)
1	7	45	38
2	26	63	37
3	10	36	26
4	20	45	25
5	4	45	41
6	10	36	26
7	26	45	19
8	10	26	16
9	7	36	29
10	20	63	43

Figure 5: Comparison results

## 5. CONCLUSION AND FUTURE WORK

In this study, we examined the potential of VillageApps, a framework to disseminate information to the underprivileged communities in their mother tongue. We conducted an initial field-test on a group of 30 volunteers. We noticed that after taking the VillageApps basic maths tutorials, more participants were able to perform better in counting, comparison and sorting tests.

We are working with the government of Pakistan to create subject lessons for class 1-6 with the help of VillageApps framework. Government already has the content for class 6-10, which is currently being taught in 256 school all across Pakistan (content accessible at: <http://elearn.punjab.gov.pk/>)

## 6. REFERENCES

- [1] Teaching and learning: Achieving quality for all. <http://unesdoc.unesco.org/images/0022/002256/225660e.pdf>. [Online; accessed 21-Dec-2014].
- [2] G. Chu, S. Satpathy, K. Toyama, R. Gandhi, R. Balakrishnan, and S. R. Menon. Featherweight multimedia for information dissemination. In *Information and Communication Technologies and Development (ICTD), 2009 International Conference on*, pages 337–347. IEEE, 2009.
- [3] S. David and C. Asamoah. Video as a tool for agricultural extension in africa: a case study from ghana. *International Journal of Education and Development using ICT*, 7(1):26–41, 2011.
- [4] H. Knoche, P. S. Rao, and J. Huang. Voices in the field: A mobile phone based application to improve marginal farmers livelihoods. In *Proceedings of SIMPE workshop*, number EPFL-CONF-173172, 2010.
- [5] M. Molapo and G. Marsden. The potential of mobile video as a medium for training low literate audiences.
- [6] N. Patel, D. Chittamuru, A. Jain, P. Dave, and T. S. Parikh. AvaaJ otalo: a field study of an interactive voice forum for small farmers in rural india. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, pages 733–742. ACM, 2010.
- [7] D. Ramachandran, J. Canny, P. D. Das, and E. Cutrell. Mobile-izing health workers in rural india. In *Proceedings of the SIGCHI Conference on Human*

*Factors in Computing Systems*, pages 1889–1898. ACM, 2010.

- [8] C. Schmidt, T. J. Gorman, A. A. Bayor, and M. S. Gary. Impact of low-cost, on-demand, information access in a remote ghananian village. In *Proceedings of the 4th ACM/IEEE International Conference on Information and Communication Technologies and Development*, page 43. ACM, 2010.
- [9] A. K. Wong, S. Y. Tang, and M. M. Cheng. Teaching motivations in hong kong: Who will choose teaching as a fallback career in a stringent job market? *Teaching and Teacher Education*, 41:81–91, 2014.
- [10] T. L. Zuze and V. Reddy. School resources and the gender reading literacy gap in south african schools. *International Journal of Educational Development*, 36:100–107, 2014.