Self-Identification and Email Application for Illiterates

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Abstract:

Here we tried to tackle the issue that illiterate face with the computer. We approached that by creating self-identification system and email application for illiterates. Regarding this scenario, we found out that illiterates are good at learning computer if they are given less icons on the page and continues voice instructions. They are good at learning the design if the pictures used doesn't contain back ground extra information but focus on the object or action. They need continuous voice help throughout the application.

We focused on the usability of our design according to Human Computer Interaction perspective and developed our application in such a way that if this website is exposed to an illiterate, he would use it without any third party help or any sort of training.

Introduction:

Illiterates are perceived as ignorant to advance technology in our society. There are millions of illiterates in Pakistan [1] and billions lies in the world [2]. Their interaction with computer is almost negligible but should we ignore more than half of world's population only because of their less responsiveness to computer & deprive them from benefits of technological advancement. Many people use email service and get benefits from them but illiterates can't. They also feel hesitation towards their involvement in technology hence they don't get involved and can't get the benefits. As the computer evolved in the early stages, it really did solve the problems but its usage among illiterates has always been a problem for which human computer interaction techniques. ICT4D is working for the development of the countries [17] and making them aware of the advanced technology and resolves the hurdles coming in people's ways.

Related Work:

They face two problems basically in using email, first they will have to identify themselves uniquely (as they are illiterates and they don't understand digits/characters) and use email service. Many people have worked on this and derived certain feasible techniques for self-identification of illiterates like mnemonics technique [3] in which he showed that illiterates can be uniquely identified by having a unique sequence of pictures stored as a password which was a better approach. Animation driven interfaces, voice driven interfaces and hybrid systems were used [4]. Another remarkable piece of work was done by Alvin H. Sacks and Richard Steele in 1984 [6] they developed the"Lingraphica" system. It was designed based on a database of"word-concepts" connected with an icon to enable communication for people with aphasia. Patients can point on these icons and drag them together on storyboards. Lingraphica automatically translates these sentence-like constructions into text and spoken words.

Illiterate Users prefer to see other person if they are communicating with someone like Users prefer video mailing instead of others like typing and sending etc. Abrupt page changes made the user fed up. Instead it should be animated/slow. Picture quality should be high and size and position on the screen does matter. Many users remembers digits by their specific shape and constant position. Precise instructions are preferred instead of a length one [7]. Generally, Voice annotation generally helps in speed of comprehension, but bimodal audio-visual information can be confusing for the target population, richer information is not necessarily better understood overall [8]. As, Speech-driven user interfaces (UI) are cheaper than display-based UI solutions and more accessible than text based UI solutions speech technologies, such as automatic speech recognition(ASR) [9] both make illiterates understand that they have to give response by voice is difficult for them as compare to visual response which we found out during our testing phase. Graphical touch-ups will help make the interface look more professional and appealing. Also, enhancement of the audio components will improve the quality [14]. For involving illiterates with technology we would have to examine their needs of information gathering and provide interaction styles for information presentation [10]. Text-free designs are strongly preferred over standard text-based interfaces by the communities which we address, and that they are potentially able to bring even complex computer functions within the reach of users who are unable to read [11]. As illiterates don't understand the text interface but hey have their own means of finding required information from mobile like they memorize the sequence to call on a specific number like they have to go to the menu and will have click on a certain familiar icons and scroll to some exact instant and dial number [12].

There should be some built in functionality The most important technique of displaying graphical reading aids for the participants was the dynamically shown pictograms by moving the pen over, or pointing on the word inside of the web browser that provide aid for the interactive communication to the illiterates [13]. To get illiterates involved with the technology we need divide our tasks into some components without letting them feel on the screen. We need to gather information step by step by making an interactive computer design for illiterates. We shouldn't be asking many questions directly on a single screen of computer but gradually making them indulge [15]. Like we can ask things from them in the form of interactive dialog boxes where task execution is done actively and it focuses user on a single screen and make them remember and understand the question and its importance [16]

Our Findings:

For giving them a unique interface we need to consider the psychology of illiterates that how do they think and how do they capture this in their minds to make them remember (for unique identity like user name and password). For this we conduct some interviews with some of the illiterates and found out something. Mostly our target was to find out that how do they use their mobile phones and how do they write text messages and how do they dial phone number of someone. After having many interviews with them we found out that they have got their own tricks of remembering phone numbers and using mobile. For example

they remember the icons combination and find their way to phone book and by remembering the first two to three letters they dial the phone number. Like they knew how to open simple lock of the phone then press a specific button to go into the menu and find phone book at a specific location with specific icon after pressing on that they would either scroll down to the desired phone number while keeping the specific shapes of the words in their minds or pressing a specific shape words that are stored in their minds.

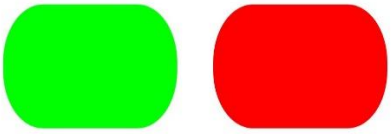
We met a lot if illiterates some of them were functional illiterates while some of them were having some basic education like middle pass. Most of them could understand the digits that they needed to dial. Things that we found out were these that illiterates understand simple sequence of combination to find out what they want. They memorize that sequence do it over and over again to make themselves familiar with that sequence? Icons are more preferred over text to illiterates understand [5]

After gathering requirements and material from paper we found out that that there was not even a single system that provides profile building for illiterates for self-identification and email application. So we decided to build an email application for illiterates and uniquely identify them by profile building. We kept in mind that we could use text as less as possible or almost negligible. We would provide constant voice help them though out the process. Our design would be self-explanatory and user friendly especially for illiterates. As they can't write the text so we will be sending and receiving voice messages instead of text. We had thought of converting text into speech but text to speech conversion was not as accurate as we thought that it would be and also we couldn't find text to speech conversion services for multiple languages like Urdu and Pashto etc. as these are our primary target at the present.

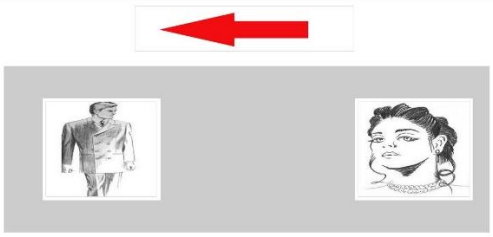
Our Proposed Solution:

To start with this, we will be displaying multiple pages to the illiterates and building their profile. Suppose an illiterates visit this website then a page will be displaying having two color boxes I-e green and red. He will be asked to select a box according to his language like green for Pashto and Red for Hindko [Fig 1]. The message will be asked in the very language. When he/she selects the box the page will display gender pics and he/she will be asked to select his/her gender [Fig 2], once the gender is selected, the next page will be having a profession sketches according to the very specified gender [Fig 3] & the user would be asked to select profession & after the selection of profession, the next page will be having two boxes displaying a Red Cross sign and Green Tic sign and the user will he asked "Does he/she already has an account with us or not?" [Fig 4]. In case of yes click the green tic box and in case of no click the red-cross box. These all questions will be asked in voice that he already selected before, user can also repeat that voice as many times as he can. The questions that have been asked will be stored as the user's profile. When the user click on the green tic box which means that he/she already has an account with us, so he/she will be asked to select his user name which would be his/her profile picture, that would be displayed to the user. After the selection of profile picture (I-e user name) user would be asked to select a specific sequence of pictures that he/she already stored as password. Once the sequence is complete then it'll be matched

with already stored in database sequence, in case of correct information the user will be logged in while in case of incorrect information the user will be asked to do the sequence again.

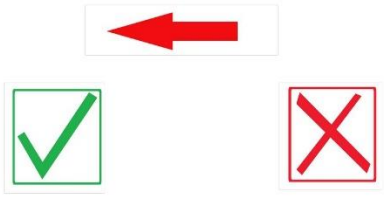


[Fig 1 Language Selection]



[Fig 2 Gender Selection]

[Fig 3 Profession Selection]



[Fig 4 Sign up/Sign in]

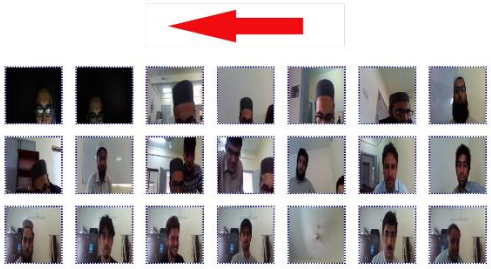
If the user doesn't has his account with us then he'd select the red cross box and will be directed to the page where he/she would be asked to capture his/her picture via webcam (which will be used as username) by clicking on the camera button (Red Cross To recapture the picture and green tic to confirm it) [Fig 5] then where he would be asked to select four pictures as password after that he'll be directed to email page [Fig 6].

At email page, subject got multiple options I-e record e email by clinking on hand holding pen icon, listen messages (Red color for unread messages and green for read messages) [Fig 7]. For email recording the subject would asked to select picture [Fig 8] to whom he/she wants to send email after selecting that he/she would be asked to record message by clicking on the mike icon and stop recording by clicking on the Stop icon. For rerecording the subject would be asked to click on circular arrow button, for listening his/her own recorded message he/she would be asked to click on the Speaker icon and for sending he/she would be asked to click on Lock Icon [Fig 9]. Back at the email page the subject would click on the much specified person whose email he/she wants to listen, there the subject got the option of listening email by clinking on Speaker icon and deleting email by clicking on the Delete Basket icon [Fig 10].

[Fig 5 Picture Capture]

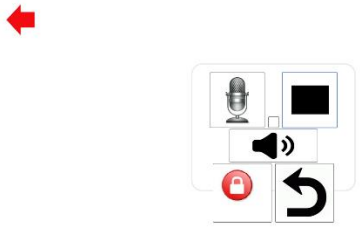
[Fig 6 Password Selection]

[Fig 7 Email Page]



[Fig 8 Select Receiver's Picture]

Throughout this application the voice was repeatedly and constantly helping and back button was used to go back.



[Fig 9 Email Recording Page]

[Fig 10 Email Listening Page]

Testing and Data Collection:

After finalizing the application, we started collecting data. We tested our application on almost 180 people. Half of them were illiterates and half were literates. We made a table having many entities about illiterates like their interactivity with computer and mobile etc. their education and age. Time to use the whole application and their detail summary about how they used that application and what problems they faced.

Only a single subject used the application at a time so they could focus upon the steps. Some of the females were also out subjects. We observed every person like what mistakes he/she made? Where he/she became happy using that application? How many times does they listen the instructions? Which part was

more usable to them? Our main purpose was to find out that how an illiterate user uses this website if he/she is exposed to it without any training? How much does he learn from this program? Does he understand this email application by himself without third party help? Does he/she remember the password? Does he/she understand the purpose of password and email?

Above mentioned are all the things that we kept in mind for during testing analyzed on the basis of these points. Some of the results are given below in the subjects' table and subjects' summary report. That how did we observe them and those parameters that we kept in mind during the testing phase.

Subjects' Table:

Good: They have used computer applications and mobiles. Already used email services.

Fair: They can only perform those limited tasks that someone has told them like play song etc.

Nil: They never even used computer or mobile.

Demo of the table is given below

Subject Name	Sex	Age	Education	Computer Interactivity	Mobile Interactivity(Smartphone)	Time (minutes)
Ahmed	m	23	Nil	Nil	Good	4
Waqas	m	24	Nil	Nil	Nil	7.2
Ihtesham	m	17	10^{th} class	Good	Good	5.8
Munzar	m	35	Nil	Nil	Nil	7.3
Asad	m	17	5^{th} class	Nil	Good	6.8
Jafer	m	28	10^{th} class	Nil	Nil	7.9
Sahid	m	40	10^{th} class	Nil	Nil	8.8
Muneer	m	19	Nil	Nil	Nil	7.1

Analysis and Conclusion:

We tested our application on almost 180 people including people from Pashto and Hindko Language. Half of them were illiterates while half were literates.

Literates used application by themselves while we told illiterates that whatever you think is good just do it. We just told them once that how to move mouse and click on something. Further, they did by themselves.

- Throughout the testing phase, we analyzed that the design was very usable. Not even a single subject found it difficult to use. Especially illiterates, they were very happy by using that application, when they go further into the application they found it interesting to use. They also overcame their fear of using computer along laptop's touch pad mouse. We analyzed that by following instructions, they either remember the very first instruction or the very last and action according to that instruction.

- We used sketches as well as pictures in our application. We also found out that illiterates were also good at remembering pictures those having no background information like colored picture of tomato or chair etc. we used these colored pictures for the purpose of password which they remembered easily. We found out that they can remember any picture or sketch which doesn't have background information but focus on the object/action in the sketch/picture.

- We used repeated voice instruction at every page which were very helpful. Illiterates used to listen every instruction and learn by those instruction. They do the action according to the much specified instruction. Instruction should be clear and precise. Less icons should be used for every page so illiterate can easily identify that what he/she has to do. If more icons are at a single so more instruction will be at that page, then divide the instructions into many parts and make the illiterate act sequentially. Like one instruction should repeatedly tell him to do a certain action, once he does act then another instruction should tell him that what to do next on the very specified page. This way we can make them understand.

- We used black and white sketches, colored boxes, colored pictures and colored signs throughout our application. We kept in mind color combination for color blind persons. We used less options on a single page to make them select from two to three icons. We used precise and repeated instruction for every page. All these things made our design so usable that not even a single person illiterate/literate had any difficulty in facing that application. We also took

reviews from them about the application and analyzed them throughout the testing but they did whatever the instructions asked them to do and that went very well.

- ⇨ There is certain time variance of using applications for literates and illiterates. Illiterates did their task (sign up and send an email) in almost 7.5 minutes, if we take their average time while literates did that in 5 minutes (average time). We also found out that once illiterates make their account and if we ask them to log in again then they don't even hear the instructions but do the action which they learnt before. This was the main success of this application that it was easily learnable as well as memorable. They did not even remembered their choices but also remembered their password and not even a single subject made a mistake for logging in. they did that in very less time.

These all were our findings throughout the application. A usable design for illiterates should use precise voice help, less icons on a page, simple and clear pictures (focusing on the object/action) which they have knowledge of. These all things would make the design usable, learnable and memorable.

Future Research:

We would try to increase the scalability of this application so more and more people could use that. We would resolve the design issues that we faced. We would make it compatible with all platforms including mobile devices. As, we were tackling with two issues first one was the login for illiterates and second one was the email for illiterates. We got affirmative results regarding login and we also found out some good techniques for this. We future, we would try to make it more usable. We would definitely work on increasing the security of the system.

Second, for email as we are sending voice messages but in future we would make this application for multi regions (multi languages) and we would add the feature of voice to text and text to voice conversion (depends upon the availability).

Hence any department or any person could use that application for sending and receiving email especially illiterates. Farmers could get information about weather and their crops upon their mobiles and they would also share that with others. All of the information regarding account would be secure with subjects' password. So they could make their account anywhere easily.

As, we have concluded what our email application results were and also what were the limitations. In future we'll work more upon the limitations and will try to resolve them. We will do modifications in the design according to the requirements of the illiterates that we got during the testing phase.

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