Usability of Online Assistance From Semiliterate Users' Perspective

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As computer-based systems proliferate around the world, an increasing number of illiterate and semiliterate people come into contact with systems they do not understand. Unfortunately, these systems are increasingly important in one's day-to-day life be it seeking employment through online applications, applying and receiving government services, seeking medical information, or simply becoming aware of current events. With more than 774 million people classified as illiterate or semiliterate, there is a need to better understand how to design user interfaces to allow this group of individuals access to online services. This article presents a study contrasting four different interface design styles providing online assistance for the task of completing an online internship application. One hundred eighty subjects in the Republic of Rwanda with low literacy skills were divided into four different groups to complete online task by using one of these interfaces. The results show that semiliterate users' performance using the online assistance improved significantly and the percentage of completed tasks increased from 52% to 94%. Statistical analysis of the System Usability Scale indicates that their average subjective usability score boosted from 39 to 80 using the online assistance.

1. INTRODUCTION

Despite many years of research in human–computer interaction, user interfaces still pose access challenges for many semiliterate users who have little interaction with technology; lack of literacy may be partly to blame. A person who cannot read and understand online information requires assistance to compensate for his or her limitations. Designing interfaces for low literate populations involves particular challenges: the needs, expectations, experiences, and environment of low-literate populations in developing nations are different from those of a designer. Online technologies intended for such groups should be developed in continuous partnership with primary users and include a thorough investigation into their

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worlds, lives, relationships, and concerns (Ahmad, 2013, 2014; Lalji & Good, 2008).

The definitions of literacy and semiliteracy are complex. United Nations Educational, Scientific and Cultural Organization (UNESCO) defined literacy in Education for All 2000 Assessment as "Literacy is the ability to read and write with understanding a simple statement related to one's daily life. It involves a continuum of reading and writing skills, and often also includes some basic arithmetic skills (numeracy)" (UNESCO, 2004, p. 12). A more abstract form of semiliteracy is defined as "a person is semi-literate, if he is poorly educated and unable to read or write with ease or fluency" (Stevenson, 2010).

Semiliterate users have a lower ability to understand and follow up written instructions, lower cognitive-processing speed, and lower organizational skills in ICT. Language is a major bottleneck for semiliterate users to access electronic services such as health care, travel, and banking services (Linden & Cremers, 2008). Extensive usage of text from menus to document contents means that semiliterates are not able to access functions and services provided in most websites.

Computers are multimedia devices that can play a significant role in the life of semiliterate people to enable them to access information. Graphics, animations, and audio assistance for applications can potentially be intelligible to a semiliterate or inexperienced technology user. Technologies adopted must be adequate to the skills of the users in order to exploit their potential effectively (Medhi, Sagar, & Toyama, 2006). Users who are not able to read a text can be aided with pictures explaining a text or they can be helped by hearing someone read the text to them (Goetze & Strothotte, 2001). Huenerfauth (2002) suggested some guidelines to design interfaces helpful for low-literate users in order to decrease the dependency on other humans. These guidelines include simple text captions to help the user to select the appropriate choice, displaying instructions in a sequence with sequence number and continuous oral assistance.

Voice-based interfaces significantly increase users' perceptions of flow and generally helps them in speed of comprehension (Medhi, Prasad, & Toyama, 2007). Gulz (2004) argued that the usage of virtual characters enhances the motivation of

low-literacy users and can be considered as an alternative to human assistance. Virtual characters are source of encouragement for users to remain in the learning environment, engage them in learning activities, and make them feel more comfortable. The implementation of a realistic avatar with humanlike gestures enhances the sense of human presence in users by simulating face-to-face communication (Qiu & Benbasat, 2005).

The previous work done for low-literate users mostly emphasized consistent help features using different graphical aids. In our study, we analyze the effects and usability of online assistance (continuous help) on semiliterate users and compare different help modes including textual, vocal, and virtual character on the performance of semiliterate users. In the experiment, 180 semiliterate users in Republic of Rwanda were randomly divided into four different groups. The task involved filling in an online form by providing basic information such as name, gender, and level of education to apply for an internship program. The purpose of the study was to evaluate the usability of different user interfaces from the semiliterate users' perspective. Specifically, we evaluated the following hypotheses:

- Users facilitated with online assistance will have better task completion percentages compared to those who were using interfaces without help.
- The subjective usability of the interface with online assistance will be higher than the average usability of the interface without assistance.
- The mean time required to complete the task for each user group will differ. In case of additional online help, more time will be required to read and understand the task.

Section 2 of this article presents related work about the problem and discusses recommendations from previous studies about designing interfaces for low-literacy users. In section 3, the details about methodology, target community, and experimental setup are provided. Section 4 discusses initial interaction of semiliterate users with the original interface, usability barriers, and design recommendations by end users. Section 5 presents newly designed interfaces and their features. In Section 6, the detailed results are discussed, and in section 7, the conclusion and future work are discussed.

2. RELATED WORK

Semiliterate users become confused when using the web, especially search engines to search for desired results. Their performance is usually lower as compared to high literate users, as they take longer to finish tasks, spend more time on the same page, and visit more pages to find the solution to their problem (Kodagoda, Wong, & Kahan, 2009). Researchers proposed minimal use of text with some suggesting text-free user interfaces (Medhi et al., 2006). The basic features of what we call a text-free user interface are simple to understand: liberal use of graphics and photographs for visual information, and voice for providing information in place of text. Studies done by Medhi,

Pitti, and Toyama (2005) on actual applications showed that users were generally successful in finding employment opportunities using text-free interfaces, whereas they were unable to do so on textual interfaces.

Language-independent icon-based interface supports users in composing their queries by means of selecting icons. The system is helpful for low-literacy users in retrieving information from the web (Maiti, Samanta, Das, & Sarma, 2011). Chaudry, Connelly, Siek, and Welch (2012) studied four graphical user interface (GUI) widgets and three different cross-page navigation styles in mobile applications with low-literate users. The purpose of the study was to compare the usability of different non-text-based widgets (such as radio buttons, check boxes, and icons) on low-literacy populations. Easy Texting messages is a mobile application that allows low-literate users to listen to SMS and compose text messages by augmenting words with touch-initiated text-to-speech support, icons for frequent phrases, and by reusing words from previous messages (Friscira, Knoche, & Huang, 2012). Kavanaugh, Puckett, and Tatar (2013) selected some U.S. adults, primarily indigenous to Appalachian Virginia with low socioeconomic status and low computer literacy to test how much usage of cell phones helps in learning of some basic computer skills. The study indicated that a cell phone can act as a scaffolding technology for learning to use a desktop or laptop computer and function as a stimulus in learning process.

Taoufik, Kabaili, and Kettani (2007) found that more interactive vocal instructions (like a digital assistant that can assist the users step by step) are needed for semiliterate users as they are usually reactive not proactive. Sherwani et al. (2007) designed, developed, and evaluated voice-based interfaces to provide health information to low-literacy community health workers in Pakistan. VideoKheti is a mobile system using speech, graphics, and touch interaction for low-literate farmers in rural India. VideoKheti helps farmers find and watch agricultural extension videos in their own language and dialect. The results show that farmers could use VideoKheti, but their success still greatly depended on their education level (Cuendet, Medhi, Bali, & Cutrell, 2013). Siek, Connelly, Chaudry, Lambert, and Welch, (2009) and Sherwani et al. (2007) figured out during the study that a low-literacy population also required help from a human facilitator while using speech-based interfaces.

The video mail interface was designed to assess the feasibility whether asynchronous peer-to-peer communication capabilities of e-mail can be made accessible to low-literate populations in the developing world (Prasad, Medhi, Toyama, & Balakrishnan, 2008). The pillar automated teller machine is a low-cost device designed for all user groups including inexperienced and potentially low-literate or illiterate users (Birnie, Rogers, & Rohan, 2011). JUPITER is a conversational interface that allows inexperienced users to obtain worldwide weather forecast information over the telephone using spoken dialogue (Zue et al., 2000).

A group of older adults with low literacy in northern California benefited from the advice and encouragement of a

virtual friend. Individuals who participated in an exercise program guided by the virtual adviser had an eightfold increase in walking compared with those who did not (King, Bickmore, Campero, Pruitt, & Yin, 2013). Text to sign language dictionary linked to Multiwordnet provides sign language animations helpful for semiliterate or deaf individuals to improve vocabulary (Ahmad et al., 2012; Barberis et al., 2011; Pianta, Bentivogli, & Girardi, 2002; Prinetto, Shoaib, & Tiotto, 2011). The system provided by Shoaib, Ahmad, Prihetto, and Tiotto (2012, 2014) focused on translating text into sign language. The signs displayed using virtual character animations are helpful for deaf users to access web information. Designing interfaces for low-literate people resembles designing for a cognitively challenged community, as some of their cognitive abilities may be less developed than those of literate and required extra assistance to complete their task (Ahmad, 2014; Thatcher & Ndabeni, 2005).

Other work in designing user interfaces for illiterate and semiliterate populations focuses on broad elements, use of graphical icons, minimal use of text, voice annotation, easy navigability, and consistent help feature (Medhi et al., 2007). The work for semi-or low-literate users is application dependent in which the usage of application is optimized by providing a broad set of helping tools. However, research to date on user interfaces for semiliterate users remains scant and usage of standardized usability metrics to evaluate user performance are seldom. In our study, we divided the semiliterate users into further three subcategories and used System Usability Scale to evaluate the subjective usability of each interface.

3. METHODOLOGY

The experimentation was carried out in two phases. In the first phase, subjects were asked to use the original interface provided by the Rwandan Government and apply for an internship program. At the end of users' interaction with the original interface, user suggestions, feedback and design recommendations were acquired. In the next phase three different types of interfaces were designed according to users' feedback. Each newly designed interface is tested by another group of semiliterate users.

3.1. Literacy Level

For the attainment of the mastery level of reading, writing, and calculating skills, UNESCO recommended in Education for All 2000 Assessment that at least basic primary education should be completed. School education in Rwanda is compulsory and free of charge for the first 9 years. Traditionally, the education system in Rwanda is divided into primary (6 years) and lower secondary schooling (3 years; Ministry of Education, 2012). To clearly understand the capabilities of low-literacy users, the participants were divided in three categories: the users who left the school in first 3 years of education, users who

completed a primary level of education, and the users who studied in lower secondary-level schooling.

Information literacy is the ability to solve problems, taking benefit from information technology and networks (Nishimuro, 1999). To evaluate users' literacy level in information technology, the participants were asked about their experience of using computers.

3.2. Participants

As described earlier, the purpose of this study was to evaluate different interfaces from semiliterate users' perspective, so our target subjects were the people who were neither completely illiterate (absolutely can not read or write) nor properly literate (studied in higher classes beyond the compulsory education in Rwanda). The appendix shows the pre-experiment questionnaire distributed among participants to evaluate their traditional literacy and acquaintance with technology. The subjects participated voluntarily in the study.

We excluded some participants on the basis of the preexperiment questionnaire. This questionnaire helped to identify which subjects can cope and interact with technology. Sixty-five subjects were discarded out of 250. Twenty-six participants were found completely illiterate, having insufficient writing and reading skills. Fourteen users were confused when performing basic interaction with the mouse and keyboard; they could not control the mouse, and some would click both buttons and could not point the mouse to the appropriate location. Sixteen subjects were discarded because they had more than 9 years of school education or had used computers for more than 1 year regularly. Two subjects with vision problems were also excluded. Finally, seven subjects were excluded for other reasons, that is, to maintain gender ratio and an age between 21 and 40 years (*M* age-29 years).

As described earlier, 180 subjects were chosen to participate in the experiment and divided into four equal groups named Group A, Group B, Group C, and Group D. Each group consisting of 45 users was further divided into subcategories of basic users, moderate users, and expert users. The details about the users are given in Table 1.

The experiments are conducted to evaluate the effectiveness of online assistance; these experiments do not deal how to enhance the users' capability to provide input in different ways. Extensive research is required to evaluate the input methods and controls to decide their effectiveness from semiliterate users' perspective. Samanta, Sarcar, and Ghosh (2013) advocated an approach to present keyboards in users' mother languages and designed virtual keyboards suitable for text entry in Indian languages. The proposed design achieved on average 21.3% higher text entry rather than with conventional virtual keyboards. In our experiments the number of women was less than the number of men due to the limited number of women work at vehicle-refurbishing sites, but the male-to-female ratio was similar among the selected groups.

TABLE 1
Categorization and Literacy Level of Participants in Each
Group

		No. of Participants		
	Education (Years)	Male	Female	Total
Basic users	Nonformal education or regular schooling (≤ 3 Years)	12	3	15
Moderate users	Primary school education (> 3 & ≤ 6 Years)	12	3	15
Expert users	Junior secondary school education (> 6 & ≤ 9 Years)	12	3	15

The subjects' primary languages were Kinyarwanda, English, and French, but semiliterate users usually speak local languages like Kinyarwanda or Swahili language, as Swahili is considered as linguafranca in much of East Africa. In our experiment, users were asked about their English and Swahili language skills, and users found with insufficient reading or writing skills were discarded as described earlier.

3.3. Tasks

The participants were given a 10-min briefing through a multimedia presentation to explain them task before the actual experimental. They were also given time to get acquainted with the system before the actual experiment. There were three tasks in the experimentation process. The first task was to fill out a preexperiment questionnaire to identify the literacy level and previous exposure with computer technology. The second task was to fill out an online form to apply for an internship program offered by the Rwandan Government (Rwanda Development Board, 2012). The internship program provides opportunities for young people to gain valuable work experience and introduce them with the industry and labor market. The internship program is a real-life application, dealing with a wide range of users and designed with all type of controls including text boxes, radio boxes, checkboxes, and drop-down lists. The variety of web controls and great diversity of intended target users were the key factors behind the selection of this interface.

The final task was the postexperiment questionnaire and short interview to take feedback from users. The postexperiment questionnaire was used to get quantitative feedback on the set of instructions provided while filling out the online application form. The interviews were helpful for open-ended qualitative feedback about missing features and suggestions to make the process more easy, robust, and user friendly.

3.4. Experimental Setup and Procedure

The study was conducted mainly in three different vehicle refurbishing (auto garages) workshops situated in three major cities (Kigali, Butare, and Gisenyi) of Republic of Rwanda. Due to the limited availability of computers on site, one group of 15 participants and one user class (basic, moderate, or expert) were called at a time. All the computers used during the experiment were homogenous with respect to operating system and environment.

All users were informed in the beginning that if they do not feel comfortable with the experiment, or they feel like this is beyond their capability or due to any other reason, and they wish to quit from the experiment at any stage, then they should not submit the form and should inform the mentor. For the internship application task, the users had to register themselves on the internship website initially by providing user name and password of their own choice. After registration, the users were asked to complete an online internship form comprised of 15 different questions. Users were not provided any human assistance during task completion to avoid any biased effect.

The experimental studies were conducted in two different sessions. In the first session, the consent form and the preexperiment questionnaires were filled out. This activity lasted for about 20 min. The second session was conducted almost after 3 weeks in which users applied for the internship and answered postexperiment questionnaires. All the users were given 25 min to complete the online application form during the experiment, and 15 min were given for postexperiment questionnaire and interview. The users were not interrupted during the online form-filling activity, and the time consumed by each user is also recorded. For true estimation of users' competence regarding task completion, they were not allowed to obtain or provide human assistance to each other. Section 6 provides the detailed results regarding average time consumed and task completion by different user groups.

3.5. Evaluation of Interfaces

All the interfaces were evaluated on the basis of task accomplishment, the time consumed and System Usability Scale (SUS) rating. SUS is a reliable, low-cost usability scale that can be used for global assessments of systems usability (Brooke, 1996). SUS is a highly robust and versatile tool for usability professionals. It has been used across a wide range of user interfaces, including standard OS-based software interfaces, web pages, and web applications (Bangor, Kortum, & Miller, 2008). SUS is considered the simplest questionnaire, yielding the reliable results across sample sizes (Tullis & Stetson, 2004).

The SUS provides a single score for the estimation of system usability and contains 10 items questionnaire with five response options on a Likert scale. This is preferred in this study due to its simple structure and property to be easily translated for non-native English speakers. It was found that a significant proportion of non-native English speakers failed to understand the

word "cumbersome" in Question 8 of the SUS so it should be reworded (Finstad, 2006). The SUS was translated in the Swahili language and Question 8 was reworded in Swahili as "I found the system very inconvenient/ difficult to use (Nimeona mfumo sana hazifai/vigumu kutumia)." It was observed how many times users acquired help in newly designed interfaces; the detailed statistics are given in section 6.

4. USERS' INTERACTION WITH ORIGINAL INTERFACE

Group A was given the task of submitting an online application for internship Program offered by Rwandan Government by using the original interface. The original interface was available only in English. The activity was closely observed by one mentor because one group was performing the task at a time. The mentor was responsible for the smooth operation of systems and to make sure that the subjects performed the assigned task themselves without getting any help from other users, and eventually conducted postexperiment interviews to take the users' feedback. During the first interaction with the original interface, it was observed that the semiliterate users faced difficulty in filling out forms without help from other individuals. Twenty-four out of 45 users were unable to answer all questions, whereas only six out of 15 from the basic users class could answer all questions.

4.1. Usability Barriers

From postexperiment questionnaires and interviews, it is observed that semiliterate users were facing the following challenges:

1. Language difficulties: Mostly basic (six out of 15), moderate (three out of 15), and expert (two out of 15) users found it difficult to understand some instructions and key terms. The key terms like "ID," "domain," and "distinction" were not clear for them. During the interview, most of the subjects requested that the contents be translated to the local language in order to understand instructions and key terms easily.
2. Vocal instructions: Six out of 45 users mentioned in interviews that if instructions are given orally in the regional language, then it will be easier to understand them as compared to textual instructions.
3. Seeking human assistance: During the interview session nine basic users and four moderate users emphasized and requested that some human should assist them in task completion. Two moderate users asked for human assistance but also were concerned and raised the issue of privacy.
4. More detailed instructions: Three basic and two moderate users insisted that instructions are too short, for example, in registration the instruction "login": is too short to be comprehended, it will be better to provide more detailed instructions like select or enter your user name to login. Some users were confused in selecting their preferred districts as it was mentioned to tick at least three checkboxes, so some of them ticked more than three districts in each province and some

of them just selected the first available three districts in each province.
5. Difficulty in understanding abbreviations: Four basic users, two moderate, and one expert user could not understand the abbreviations of bank names; they insisted on providing the complete bank name in the interface (i.e. in place of BNR, the complete name of bank "The National Bank of Rwanda" should be used). Some expert users suggested that giving abbreviations in parentheses after the complete name of the bank and logo of the bank may also help to recognize the bank name.
6. Others: Four users mentioned some other usability issues. One user recommended a bigger font size. Three users were unable to select the right domain for them as some similar choices were ambiguous for them (i.e., Agriculture: crop production or Agriculture: vegetable production). The reason is obvious and understandable, as with low literacy it is difficult to differentiate closely related fields.

Figure 1 shows the overall percentage of users from Group A who highlighted specific usability issues.

4.2. Design Recommendations

The following design recommendations were learned from semiliterate users' feedback:

1. Provide translation in the local language.
2. Add vocal instructions, especially for more low-literate users.
3. The purpose of the experiment was to decrease dependency of semiliterate users on human assistance, so it was decided to add lifelike characters to replace human assistance and to maintain privacy.
4. Include some additional functional instructions to assist in task completion. In case of short instruction like "Enter your name" a complete functional instruction that "Move your cursor and click in following text box and then write your name" should be given.
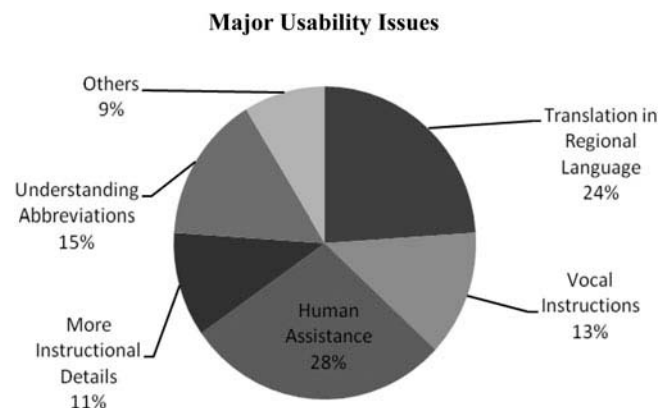5. Provide the full names in place of abbreviations.

Major Usability Issues

FIG. 1. Major usability issues found in first interaction with original interface by users of Group A.

5. DESIGNING NEW INTERFACES

The feedback from semiliterate users with the original interface of internship program led us to redesign the original interface. This interface was modified and redesigned with some additional help for semiliterate users to assist them in task completion as well as translation of contents into the local language. New interfaces were designed in such a way that in the very first contact with the interface, the users will get clear instructions about what they are supposed to do and how it can be achieved.

We designed three new interfaces known as textual interface, vocal interface, and virtual character-based interface. For all the new interfaces, structure and overall layout were kept the same. The users' interaction (the way the users get help) in the newly designed interfaces is the same, but the mode of help is different (i.e., it is either textual or vocal or through virtual character). In the newly designed interfaces, help was provided on demand. A button labeled with an interrogation mark was added with each instruction. By clicking the button, users received help about the specific task in the Swahili language. The help is shown in a pop-up window alongside the button and usually remains visible until the user clicks the close button. Figure 2 summarizes the approach adopted in the newly designed interfaces. In the textual interface, additional help is provided onscreen in textual form in Swahili. The translation is initially carried out using Google translation application programming interface (API) and on the later stage it was cross-checked and verified by a native language speaker from Rwanda. The translated text consisted of the two parts. The first part contained the details about the steps required to fill up a field of the internship application form, whereas the second part was about the actual instructions, for example, in

case of selection of birth year from a drop-down list, a complete functional instruction was given as "Please move your cursor, click the small drop down arrow button given at the right side of text box and select your birth year (Tafadhali sogeza mshale, bonyeza kwenye kifungo kidogo na ushushe chini upande wa kulia kwenye kisanduku na chagua mwaka wako wa kuzaliwa)."

In the vocal interface, recorded audio instructions in Swahili were played on users' request. In the virtual-character-based interface, an expressive virtual human was added to the user interface, which provided functional instructions vocally. The virtual character was lip synchronized with Swahili and looked like a female assistant. Figure 3 shows a user testing a newly designed virtual-character-based interface. In the newly designed interfaces, the complete bank names were used instead of abbreviations (e.g., the abbreviation "BCR!" was replaced by its complete name "Banque Commerciale Du Rwanda (BCR)").
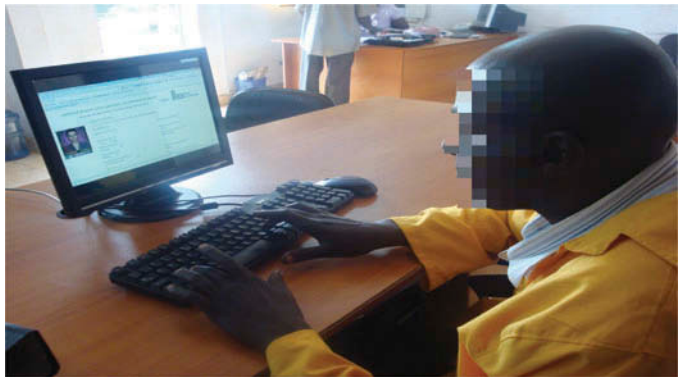

FIG. 3. A semiliterate user is testing newly designed virtual character based Interface in Republic of Rwanda.
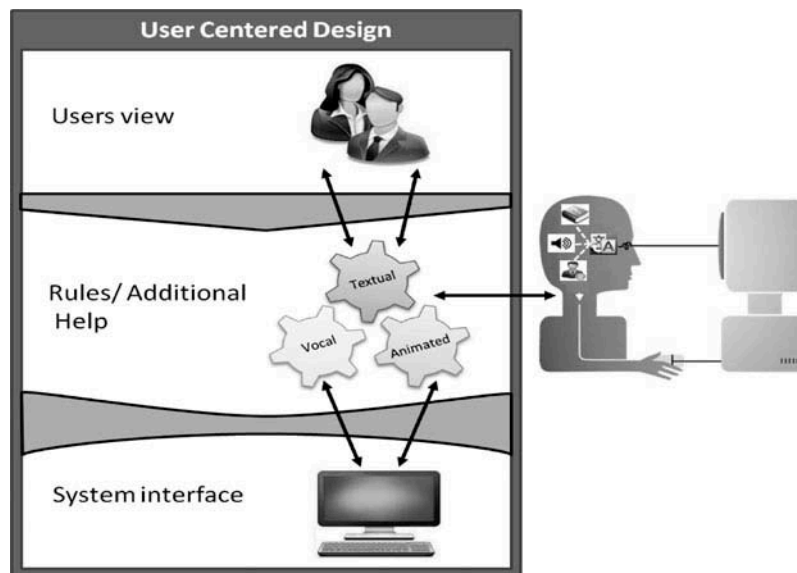

FIG. 2. User Centered Design approach adopted in newly designed interfaces.

6. RESULTS

Group B used the redesigned textual interface. Group C used vocal interface, and Group D used virtual-character-based interface. For a better understanding the variations observed in performance metrics including task success, time on task, and users' preference, the results are not only compared between groups but also compared within the groups.

Figure 4 shows the mean time variation found within basic, moderate, and expert user categories of each group. Group A spent the least time in interaction with original interface, in contrast to Group D, which consumed the most time in inter-action with virtual-character-based interface. In newly designed interfaces help was provided in English and Swahili. Acquiring help and reading the bilingual instructions could be the possible factors and reason for spending extra time on newly designed interfaces. A single-factor analysis of variance test conducted shows statistical significance ($F = 29.21 > F_{crit} = 2.66$, $p < .05$) and reject the hypothesis that the average time consumed by all user groups is equal. Expert users comparatively consumed less time and were more efficient in task completion.

The important question is whether the performance and task completion percentage of users consuming more time on newly designed interface was improved. To answer this question, we counted the number of fields where the users had successfully entered valid data. If any field in the form is incomplete, empty, filled with invalid data, or makes no sense, then it is not considered complete (e.g., numerical values in name or email address without proper structure).

Figure 5 compares the percentage of task completed by all types of users in each group. On average, Group A completed 52%, Group B completed 70%, Group C completed 84%, and Group D completed 94% of the assigned task.

Overall, 47% of users in Group A successfully filled and completed all fields of internship application. There were 18% of users who gave up and did not provide an answer in any field, whereas 35% users partially filled out the form. Five out of 15 (33%) of basic users showed an inability to understand
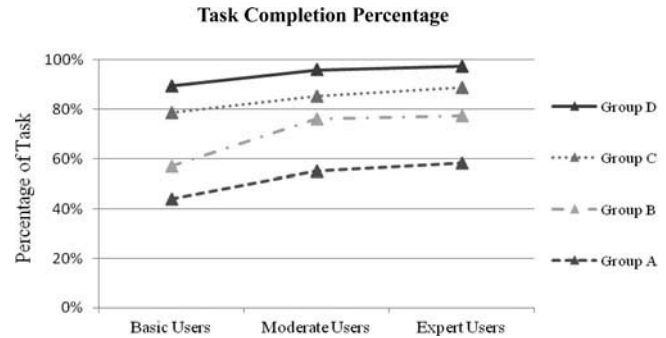

FIG. 5.   Percentage of task completion by all types of users in each group.

instructions and gave up. In Group B, 67% of users answered all fields of the internship application, whereas the percentage of users who failed decreased significantly, and only 7% of users gave up. In Group C, 73% of users were completely successful, whereas in Group D, 87% of users successfully filled out all the fields. From Figure 5, it is clear that new features added to the existing interface had a significant impact on the performance of semiliterate users. Although Group B, Group C, and Group D consumed more time, their task completion percentages were higher than Group A.

After submitting an internship application, all users were given a SUS questionnaire to collect their feedback on the subjective usability of each interface. The same questionnaire was used for all types of users and groups, so that their results can be compared. Figure 6 shows the average SUS score of all user categories of the four groups. Error bars represent the 95% confidence interval for the mean. The average subjective usability score is almost double of Group D (SUS score = 80) for the virtual character based interface as compared to Group A (SUS score = 39) that used original interface. The SUS mean of basic users in Group B was 49 as they showed the least interest in textual interfaces among newly designed interfaces. A single-factor analysis of variance test conducted on system usability scale ($F = 57 > F_{crit} = 2.66$, $p < .05$) shows that the average
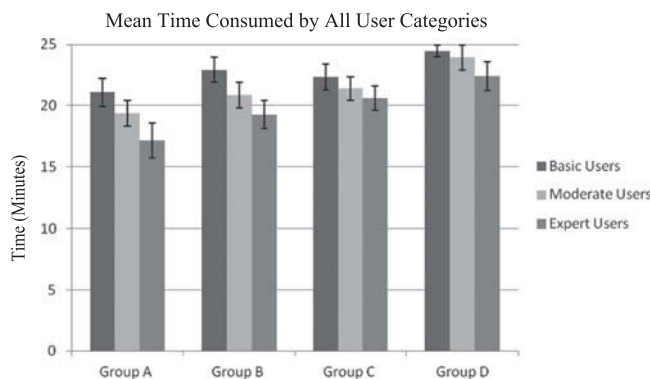

FIG. 4.   Comparison of mean time consumed by each category of users in every group for online internship application. *Note.* Error bars represent a 95% confidence interval.
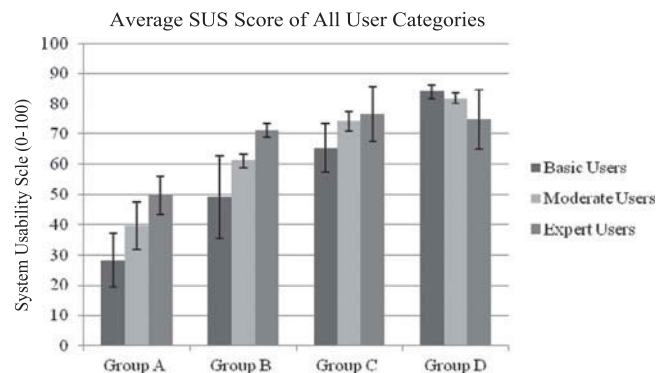

FIG. 6.   The average SUS score of all user categories in four groups that used different interfaces. *Note.* Error bars represent the 95% confidence interval for the mean.

TABLE 2
Average number of times the functional help is acquired in newly designed interfaces

	Help Acquired (Average)		SD	95% CI	Minimum Clicks	Maximum Clicks
Group B	7	Expert 6 / Moderate 7 / Basic 7	2	1	2	12
Group C	8	Expert 6 / Moderate 7 / Basic 7	3	1	3	15
Group D	10	Expert 6 / Moderate 7 / Basic 7	4	1	2	19

Note. CI = confidence interval.

subjective usability score of each user group is different in all four types of interfaces.

Independent samples *t* tests were conducted to compare newly designed interfaces with the original one. The average SUS score of Group B ($M = 60.49$, $SD = 18.23$) was significantly greater than Group A ($M = 39.22$, $SD = 17.27$) conditions, $t(88) = 5.68 > T_{crit}$ (one-tailed) = 1.66, *p* value < .05. Similarly, the average SUS score of Group C ($M = 72.06$, $SD = 14.84$) conditions, $t(86) = 9.67 > T_{crit}$ (one-tailed) = 1.66, *p* value < .05, and Group D ($M = 80.17$, $SD = 12.14$) conditions, $t(79) = 13.01 > T_{crit}$ (one-tailed) = 1.66, *p* value < .05, were significantly greater than Group A. These results suggest that online assistance has an effect on average subjective usability of interfaces.

Table 2 provides the details about the number of times the users clicked the question mark button and acquired help in newly designed interfaces. There were 15 instructions on the internship application form, whereas in the virtual-character-based interface the help-seeking average was 10. The maximum number of clicks for seeking help was 19, which suggests that some users tried to acquire help multiple times from the virtual character to understand each single instruction. The data also reveal that users acquired more help in the newly designed interfaces than the original one, and it also improved their performance in task completion as shown in Figure 5.

7. CONCLUSION AND FUTURE RESEARCH

To our knowledge, this is first in-depth study of semiliterate users' interaction with a real-life application, in which semiliterate users are further divided into three subcategories according to their formal schooling. The role of online assistance is evaluated and measured by usability metrics.

Mere availability of interfaces is not sufficient for a user who lacks basic reading and writing skills. The results indicate that in applications subjected to low-literacy users, performance greatly depends on the assistance provided to cope with their inability. Thanks to the online assistance, about 87% users were able to complete their task, whereas without online assistance only 47% users could complete the assigned task.

It is also pertinent to mention that literacy or some knowledge of information technology decreases users' dependency on extra assistance, as on average moderate users required help number of times a fewer than basic users. The expert users required help even fewer times as compared to moderate users as shown in Table 2. The major reason behind the failure of Mr. Clippy (Microsoft Office assistant) was the impolite behavior, as it was hijacking user control and trying to help everyone without being asked (Whitworth, 2005). In our experiment the help is provided on demand. The subjective usability rating (SUS score) for virtual-character-based interface, which was 84 by basic users, shows that such systems are more effective, efficient, and satisfactory for more low-literate users.

The idea of online assistance can be enhanced by providing an independent API to the designers with all the features of multimedia help. The translation process can be linked with the existing API and can be enhanced by text-to-voice features. The virtual character will be used in the public websites containing only textual information.

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APPENDIX

Preexperiment Questionaire

1. How old are you (number of years)?
2. How many school years have you attended? Please circle the corresponding number:
   < 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 >

   a. Have you attended any informal training to get or enhance your reading/ writing skills? If yes, how many months?

3. What are your English language skills?

Read	No Knowledge	o	o	o	o	o	Fluent
Speak	No Knowledge	o	o	o	o	o	Fluent
Write	No Knowledge	o	o	o	o	o	Fluent

4. What are your Swahili language skills?

Read	No Knowledge	o	o	o	o	o	Fluent
Speak	No Knowledge	o	o	o	o	o	Fluent
Write	No Knowledge	o	o	o	o	o	Fluent

5. Have you ever used a computer (PC)?

   – Just sometimes (a very few times in a year)
   – From time to time (a very few times in a month)
   – Quite often (weekly)
   – Usually (quite daily)

   a. If you often or usually use a PC
      i. How many months or years have you been using a PC?
      ii. What kind of system you used?
         – Desktop computer
         – Laptop / Notebook
         – Touch pad / tablet
      iii. Have you ever submitted any online application? If yes How many times almost?
      iv. Have you ever made your own resume?
      v. Have you ever performed any online financial transaction?
      vi. Do you have a personal email address?

   b. If you use a computer very rarely, sometimes, or from time to time
      i. Where did you use the computer?
         – Own
         – Through a friend
         – At job
         – In net cafe
      ii. Are you comfortable in using mouse or touch pad?
         – No
         – With little difficulty
         – Yes
      iii. Can you write with a keyboard?
         – Very easily
         – With little difficulty
         – Cannot write

6. How is your vision? (How do you see?)

   – Normal
   – Corrected to normal (use of glasses)
   – I can see things better up close than far away
   – I can see things better in the distance but not up close
   – I generally can't see well

   Question 5 has two parts. Either answer 5(a) or 5(b) but not both.