Design Methods to Reduce Technology Fear and Solicit Feedback from Lady Health Workers (LHWs) in Pakistan

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ABSTRACT
This paper presents findings from initial user research to understand key work-related problems that Lady Health Workers (LHWs) face in their day-to-day duties, potential technology-based solutions to identified ICT addressable problems, and design methods that can help overcome fear of technology and enable end-users to participate in co-design.
We conducted 3 rounds of interviews with 10 LHWS and 2 supervisors. Our main results show that LHW's have fear of technology that can be reduced through colorful, user-friendly wizard-of-ox prototypes before training LHWs on high fidelity prototypes.

1. INTRODUCTION
In order to provide primary health care facilities to the community, the National Program for Family Planning and Primary Health care employs around 48000 Lady Health Workers (LHWs) to provide outreach in almost every part of Punjab. Lady Health Workers (LHWs) are frontline workers who work in their own community and are trained to provide basic healthcare services to their community. Each LHW serves a population of ~1000 people or 150-200 homes, and makes 10 to 15 household visits every day. With community counselling as their core responsibility, they are responsible to provide promotive, preventive, curative and rehabilitative services to the community. They also educate and provide education about Family Planning methods and MCH services. The LHWs are also accountable for maintaining comprehensive records for all patients under their charge by updating a *Family Register*, their *Daily Dairy* and *Treatment & Family Planning Register*. Besides these daily tasks, they also act as indispensable team members for the effective delivery of key national interventions such as Polio Eradication Initiative (PEI). Usually the PEI intervention lasts for a week. So in the months they have any such intervention (PEI or otherwise), their regular monthly schedule is packed into three weeks and they have to do more work to reach their goal [1] [2] [3].
Keeping in view the community network of LHWs and their strong bonding with all the members of a house, many MCH (Maternal and Child Health) interventions in developing countries reach out to communities via LHWs. Counselling is a major part of their duty. Hence in order to boost their role as health counsellors, several interventions have used ICTs to support health workers and to make their work easier [4][5][6]. Due to its huge penetration in developing countries, mobile phones are being used in different ways to facilitate LHWs. For instance, mobile video based counselling of community not only improves the counselling but also helps in promoting the health workers' efforts in unreachable community [7]. Similarly, phone-based dialogic messages that provoke responses from expecting mothers have been shown to improve the quality of counselling sessions [8]. Many non-profit organizations in the developing countries are using mobile phone technology to make communication better between LHWs and expecting mothers. Examples include Motech [9], liga inan [10], and Medic Mobile [11] among others.

Comparatively, in Pakistan the spread of mobile and ICT based interventions in healthcare has been slow, especially in rural areas [12]. This is namely due to issues of accessibility, lack of infrastructure, poor well-being, illiteracy, technology inhibitions, etc. Health line is among the few ICT systems tested with healthcare workers that used landline phone system to provide information in their native language using automated speech recognition [6].

Using three rounds of semi-structured interviews with the same cohort of LHWs and their supervisors, we try to investigate the workload of LHWs that could be made easy with an ICT-based intervention. We also try to identify strategies that can reduce their technology fear that was identified in our second round of interviews by making and testing user-friendly mock-ups in the third round of interviews.

2. USER RESEARCH & METHODOLOGY
In order to understand the daily work routine and tasks of LHWs, the amount of technology usage in their daily life and possibilities of technological interventions to make their work routine easier, we conducted in-person semi-structured interviews with ten LHWs and two supervisors of LHWs. We conducted three rounds of interviews with the same cohort of LHWs and supervisors. The idea of conducting the first round of interviews was to gather information about their daily routine, tasks such as data entry that they do daily, the registers they carry from one house to another, and the counselling that they have to do on daily basis. In the second round of interviews, we came up with paper-based mockups of digital registers. Based on their unpredicted response to these mockups and identified technology fear in the second round, we iterated our designs to be more user friendly and used small group training sessions instead of large group one-to-man training style commonly used in trainings for public sector employees. In this last round, we presented colored mockups for training before handing the actual technology to the LHWs to test the usability.

2.1 Initial Interview with LHWs
In order to learn about LHWs' work in the field, we conducted an initial semi structure interview session with 10 LHWs and 2

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supervisors from a Basic Health Unit (BHU) in a semi-urban part of Lahore, Pakistan. The initial interview protocol focused on four topics: what is the job description of LHWs i.e. how they spend a routine work day; their daily interaction with ICT, what problems they are facing in field regarding data entry and counselling; and identifying, if any of these problems could be addressed with an ICT-based intervention. These semi-structured interviews with ten LHWs and 2 supervisors took place over 3 hours in parallel sessions at the BHU. All the responses were recorded on paper.

2.2 Findings from Initial Interview

Below, we report on the overall findings from LHWs and supervisors, as well as the major themes that arose in the interviews.

2.2.1 Status of LHWs and their Technology Interaction

90% (n=9) of LHWs interviewed had completed 10^{th} grade or higher level of education and 30% (n=3) had over ten years of experience as a LHW. All of them had personally owned feature phones. 2 of them use their phone just to receive calls due to limited technology literacy, 4 of them use their phone to receive SMS and calls, while the rest were comfortable in making and receiving calls as well as sending and receiving SMSs. Those who don't know how to make calls or send SMS by themselves ask their children to do so for them and mostly the content of these SMS and calls comprises of sharing contacts between family and friends. None of them use Internet, either on a phone or on a computer. They've never opened a browser on a smartphone/computer to search for anything. 6 of them have a television (TV), Radio or computer at their home. Those who have TV can operate it by themselves via remote control. Those who have radio, ask their family members to tune it for them when they want to hear news or songs. Those who have a computer were unaware that a computer could be used to watch videos, and believe that a computer can only be used for study purpose.

2.2.2 Data Entry on Registers

One problem that they face throughout the day was to carry their three registers (Family register, Daily dairy/register and Treatment & Family Planning register) with them in the field. They might not need all three registers in a home on a single visit. Some sections in these registers have folded leaves that open up and make a larger sheet than the dimensions of the paper. LHWs have to write only on a small section of this larger sheet, so it is really inconvenient for them to handle and to write on these pages.

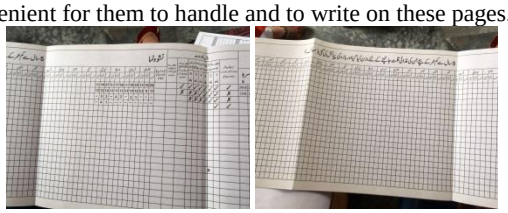

Figure 1:The images of a same page (for kids vaccinations and height, weight till the age of 5 years)

2.2.3 Counselling of Family Members

Counselling is a major part of a LHWs' day job. While talking to LHWs about how they go about counselling, one of them said:

"It depends on the area. We are in pretty much urban setting where people are literate enough and consult doctors from public hospitals so they don't need much counselling. But we still do counselling meetings."

Another LHW said:

"When we go for counselling and they (mothers) are busy so they said that we already know what you guys want to talk about, please come some other time."

Hence these constraints refrain this particular cohort of LHWs (semi-urban) for holding health counselling session on pregnancy, family health care and family planning etc. Their counselling meetings sometimes turn to' gossip places, as reported by a LHW.

2.2.4 LHWs need some Authority

LHWs have referral slips that they use to refer patients to nearby public hospitals. They complained that the referral slips have no real value in public hospitals, as their patients have to wait the same amount of time as other patients. Due to this LHW patients don't pay much heed to their referrals, and patients prefer to go to a hospital of their own choice.

Making data entry on registers easier interested us, while changing the rules around referral slips at public hospitals involved changes in government policy, so we opted not to address it at this point.

2.3 Making Data Entry Registers Compact and Easy to Fill via a Smartphone

We took a sample of their "daily diary" register to find out its details, and how we can make it compact and easy to fill using technology.

This register has 6 major portions including: Monthly schedule, Expecting mothers list, Community support group meeting, Family planning, Kids record, Health committee meeting report.

We proposed a smartphone or tablet based e-register that is easy to carry door to door, easy to enter details and a representation of only relevant data in a user friendly way.

The points we focused on were:

- ***Remove duplicate entries:*** We found out that a couple of columns occur repeatedly in registers and LHWs fill the same data multiple times. Hence if they populate or write it once on an app, it can be auto populated at the other locations.
- ***Hide data if not required at the moment:*** For large folded pages in registers as shown in figure 1, we can hide certain columns and give them an option to view those columns only if needed.
- ***Drop down menus:*** Many fields in registers require one or more options from a fixed number of options. To avoid individually entering these options, we proposed to provide drop down menus LHWs can easily select from.
- ***Real time calculation of date entries:*** Many entries in register require real time calculation of dates to be filled. We can autofill them using algorithms e.g. from the LMP (Last menstrual Period) of an expecting mother, we can calculate their EDD (expected date of delivery), expected time remaining in delivery, the dates for four ANC (antenatal care) visits etc. This will reduce erroneous entries and will save LHW time.
- ***Comments/Remarks section:*** Almost every section of a register has a comments/remarks field. We proposed the audio recording for those fields, as upon asking them how they utilize this information later, LHWs reported that the comments are just for reference and they hardly look back at them.

We designed mock-ups on paper for an app-based version of the daily dairy of LHWs to get their feedback and to clarify some

confusion faced while designing mock-ups. The flow of our mock-ups is shown in figure 2. We did not want to overwhelm LHWs by showing them the entire list of sections in the digital register; hence we chose the "Pregnant women list" for paper mock-up feedback. We decided to explain the flow of every screen before moving on to the next screen, in order to make it easy for LHWs to understand. Images of paper-based mock-ups are shown in figure 3.

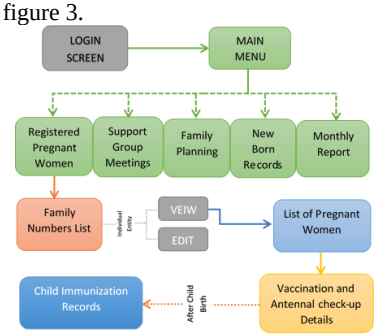

Figure 2: Proposed mobile app Flow

2.4 First Follow-up Interview with Paper Mock-ups

To check the level of understanding around mobile apps, we conducted another round of interviews with paper mock-ups. We did not design software mock-ups, as we did not want the introduction of a new medium to get in the way of feedback. We divided LHWs in two groups i.e. 5 LHWs and 3-research assistants from our team were part of each group. We then explained the concept of a paper mock-up and how these mock-ups will appear on a smartphone. Each of these sessions lasted for around 3 hours at the BHU. LHWs were more comfortable with manual data entry in registers compared to a technology-based solution, as they had apprehensions about technology.

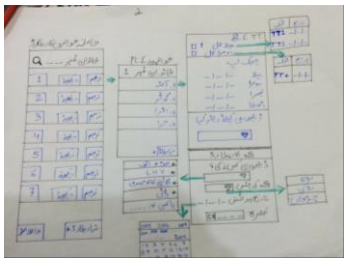

Figure 3: Paper based Mock-ups

2.5 Finding from 1st Follow-up Visit

Below, we report the major themes that arose during their session with paper mock-ups.

2.5.1 LHW Reaction on replacing paper registers

The reaction of LHWs on eliminating paper registers was surprising for us. They had a strongly negative reaction, asking how they would manage their tasks if they didn't have paper registers. While explaining the importance of registers in their daily life, one LHW said:

"If I ever have a fight with my husband and I have to take one thing with me to my mother's house, I'll take my registers, because these registers are the reason why I get salary"

They could not imagine lives without their paper registers. Upon introducing the paper mockups of the mobile app that they could use as an alternative, they refrained from trying it and said that they were happy with paper registers.

2.5.2 Underlying sentiments around technology

LHWs are not trained to use technology at work, and rarely interact with it at the home. It is hard for them to imagine themselves using a software solution rather than paper, something they have used for many years. They have sentimental value attached to the data that they collect in their registers, even though it is not used as effectively in its current form. When we told them about how an e-register would work, they asked these questions:

- If app crashes that what happens to the data?
- What does it mean that data will go to central server?
- Can we see data again after uploading it or it's lost?
- Our phone usually have low battery when we go to field, what will happen if this phone turns off due to low battery?

They were less concerned about the interface and had more questions about the technology itself. These questions show that any roll out of a technological intervention without prior acclimatization to technology would have a negative result.

2.5.3 Lack of interest for paper basked mock-ups

While trying to solicit feedback from LHWs on paper-based mock-ups, we found that there was limited interest in the mock-ups. When there was limited belief in the system, or the introduction of technology elicited a fearful response, it was hard to engage LHWs in a meaningful dialog around usability. While there is an increased movement towards co-design, our findings point out to how it is difficult to practice co-design when potential users are averse to the idea of technology itself. Once we had determined that it would be impossible for us to get usability feedback, we allowed the conversation to route towards why they perceived technology usage as a threat.

2.6 Making Mock-ups more Appealing and Real

After answering questions around technology, we decided to:

1. Make the mock-ups more appealing to LHWs. The reasoning for this decision was to invite the LHWs into at least interacts with the mock-ups.
2. Make a functioning android app and have the LHWs try out the *real thing*, in the hope to get buy-in.

2.6.1 Redesigned mock-ups

We followed the same flow diagram as shown in figure 2 but in this iteration, we made mock-ups with stock paper and colorful sticky notes in order to make it look appealing to LHWs. We used Wizard-of-Oz prototyping, by making a dummy phone with foam and made separate screens on individual stock paper, so that we could quickly replace the screens every time the LHW pressed a button on the dummy screen. We created a special option for viewing previously submitted data, given their major concern on saved data being lost. Card mock-ups took the LHWs through each and every step and functionality of the whole application.

Figure 4: Stock paper based dummy screens and phone

2.6.2 Actual Android Application

Besides the app flow and cardboard mock-ups, we developed an initial basic android application for LHWs. The purpose of this application was to familiarize the LHWs with a real application after they were apprised of the flow of the application. Figure 5 shows the front end of android application.

Figure 5: Android App mock-ups

2.7 Findings from Second Follow-up Interviews with wizard-of-Oz prototype and real android app

The main purpose of conducting this follow-up visit is to determine that if the colorful stock paper mock-ups increase the interaction with the mockups, and if training on these colorful mock-ups increases their interaction with the actual android app. These interviews were conducted with the same cohort of LHWs and their supervisors. This session ran for 4 hours while running it in parallel with 2 groups of 5 LHWs and 3 RAs per group. We first showed them the cardboard mock-ups and guided them about the flow of the app. We then gave the android app one-by-one to every LHW and asked her to perform a simple task to reach to the "expecting mothers of Family no. 1".

2.7.1 Colorful cardboard mock-ups as a helpful training tool

Colorful cardboard mock-ups and dummy screens were very helpful in making LHWs understand the application flow. According to LHWs, training by making small groups and explaining using Wizard-of-Oz prototyping helped them in understanding the system better.

2.7.2 Task Completion on Android App

After giving them training on cardboard mockups, when we asked them to perform the same task on the actual android app, all LHWs (technology literate and otherwise) were able to complete the task with little or no help. They enjoyed using the app after the training session and they did not fear the technology.

3. DISCUSSION AND CONCLUSION

The findings from our 3 rounds of interviews revealed that existing LHWs in semi-urban areas of Pakistan have limited interaction with technology in their daily life, which leads them to fear the introduction of technology in their work life. LHWs are very comfortable using paper-based registers, and while they are cognizant of the challenges that come with paper-based registers, they are resistant to change. LHWs associate sentimental value to paper registers, and it is almost impossible for them to imagine lives without these paper registers. During our third round of interviews, a couple of LHWs told us about a polio campaign in which smartphones where given to them. These phones had an application for polio coverage and monitoring. LHWs had to upload pictures of wall chalking they do at every household where they administered polio vaccines. According to LHWs, the polio app was tested in field only for 3 months and many LHWs were unable to use it. Those who fulfilled their daily targets and uploaded results were given financial incentives by the Punjab government. According to LHWs, the government implemented the app without consulting them or giving them proper training. So according to LHWs, even financial incentives could not encourage them to use the app, given the poor usability of app. Incentive or Pay for Performance (P4P) schemes work best when the payment rates are high and the effort required is minimal [13]. LHWs liked the way we trained them during our 2nd follow-up visit which led them to perform tasks confidently. Future work involves finding out details on the polio app pilot, and an extended field trial of the app, asking LHWs to gather digital data for a section of the register. Once data from an extended field trial is available, a similar procedure can be used to design the complete workflow and substitute the registers with an app.

4. REFERENCES

[1] A. Hafeez, B. K. Mohamud, M. R. Shiekh, S. A. I. Shah and R. Jooma, "Lady health workers programme in Pakistan: challenges, achievements and the way forward," *JPMA-Journal of the Pakistan Medical Association*, vol. 61, no. 3, p. 210, 2011.

[2] "National Programme for Family Planning & Primary Health Care, Pakistan," Punjab Government , [Online]. Available: http://lhwp.punjab.gov.pk/website/Introduction.aspx?id=12.

[3] B. DeRenzi, N. Lesh, T. Parikh, C. Sims, W. Maokla, M. Chemba, Y. Hamisi, M. Mitchell and G. Borriello, "E-IMCI: Improving pediatric health care in low-income countries," in *Proceedings of the SIGCHI conference on human factors in computing systems*, 2008.

[4] S. Grisedale, M. Graves and A. Grunsteidl, "Designing a graphical user interface for healthcare workers in rural India," in *Proceedings of the ACM SIGCHI Conference on Human factors in computing systems*, 1997.

[5] J. Sherwani, N. Ali, S. Mirza, A. Fatma, Y. Memon, M. Karim, R. Tongia and R. Rosenfeld, "Healthline: Speech-based access to health information by low-literate users," in *Information and Communication Technologies and Development, 2007. ICTD 2007. International Conference on*, 2007.

[6] 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*, 2010.

[7] D. Ramachandran, V. Goswami and J. Canny, "Research and reality: using mobile messages to promote maternal health in rural India," in *Proceedings of the 4th ACM/IEEE International Conference on Information and Communication Technologies and Development*, 2010.

[8] B. MacLeod, J. Phillips, A. E. Stone, A. Walji and J. K. Awoonor-Williams, "The architecture of a software system for supporting community-based primary health care with mobile technology: the Mobile Technology for Community Health (MoTeCH) initiative in Ghana," *Online Journal of Public Health Informatics*, vol. 4, 2012.

[9] "Liga Inan," [Online]. Available: http://www.ligainan.org/.

[10] "Medic Mobile," [Online]. Available: http://medicmobile.org/.

[11] A. R. Chachhar, M. N. Osman, S. Z. Omar and B. Soomro, "Impact of satellite television on agricultural development in pakistan," *Global Media Journal*, vol. 2, no. 2, pp. 1-25, 2012.

[12] "The Contribution of Lady Health workers towrds Family," Research and Development Solutions, USAID, 2012.

[13] P. Basinga, P. J. Gertler, A. Binagwaho, A. L. Soucat, J. Sturdy and C. M. Vermeersch, "Effect on maternal and child health services in Rwanda of payment to primary health-care providers for performance: an impact evaluation," *The Lancet*, vol. 377, pp. 1421-1428, 2011.