# Usability Guidelines for Designing Knowledge Base in Rural Areas

## Towards Women Empowerment

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**Abstract.** The paper discusses issues related to Design, User experience Usability involved in designing the interface to be used in rural areas. This study analyses the problems based on tests done on the interface in the villages of Punjab, Pakistan. Rural development is based on economic, social and human development. Whereas, Software Requirement Engineering focuses on how requirements can be gathered to achieve better end product. We aim to discuss software requirement gathering process in rural areas and attempting to elicit requirements from Pakistani rural woman. This could help us in bridging the technological gaps exist between rural and remote areas. Our aim is to find a solution for this barrier by designing software for rural woman of Pakistan. Further break down of our study is health issues with rural woman by adopting software requirement gathering on various e-health issues.

**Keywords:** software Requirement Gathering, Requirement Elicitation, Software Development Life Cycle, SDLC, Rural Development.

## 1    Introduction

The purpose of this study is to investigate how Pakistan farmer can be benefitted by modern technologies. This study also assumes that famers are already engaged in tacit knowledge directly or indirectly therefore how tacit knowledge can meet explicit knowledge to foster effective knowledge sharing. It is also to be noted that traditional forms of communication such as radio and televisions overlook the rural community. On the other side, mobile phones and computers both are out of their reach. Pakistan is one of the six most populous countries on globe and second largest country in South Asia. People living in rural areas according to the World Bank report 2012, have a literacy rate of 44 percent overall (58 percent for men and 29 percent for women).  According to a survey in 2006-07, roughly agriculture is accounted for between 38-45 % of world's labor force whereas in the developing countries it is about 55% of the labor force in agriculture. Agriculture is the largest income and the employment-generating sector of Pakistan's economy. Services are provided via Mobile phones and other means like websites to the laymen. But still such services are not that much famous due to different reasons.

According to the survey presented by Pakistan Survey Organization, women hold 52% of total population of Pakistan whereas 68% of them are living in rural areas. There are various factors like economic, social and human development on the basis of which rural community develops. Due to cultural issues [14][15][16][17][18][19], men's control and religious boundaries rural women do not have less access to information. Due to the technological barrier, rural areas of Pakistan are still far behind in helping Pakistan in socio-economic development. Various aspects of women's status in Pakistan are treated as independent variables, but she herself could decide whether she remains independent or not. Some of the aspects are: mobility, economic autonomy, access, fear of husbands, communication with spouse and decision making.

Women living in rural areas has to face challenges like literacy, socio-economics, religion and technology. Current research focusing on information technology diffusion in rural markets highlights a variety of challenges like socio-cultural and technological infrastructure of rural communities. Rural development is based on economic, social and human development. Rural areas in general are mostly illiterate. Consequently, these areas are far behind the urban areas.

Neils (13) proposed 7 C s, i.e., Connectivity, Content (Static and Dynamic), Context, Cash, Culture, Community and Communication for rural areas. He did not consider rural culture in general specially developing countries. He also ignored the role of tacit and explicit knowledge. We need to understand rural areas' norms, their values and diverse dynamics. Nonaka and Takeuchi's (11) model can be helpful to achieve successful result. The tacit knowledge of a rural community needs to transform into explicit knowledge. Rural community based on their local knowledge instead of global knowledge. Rural area needs bridge between local knowledge and global knowledge. This bridge can be built by providing information according to their preferred mode. Davenport and Prusak (10, cited by Hess, 11) proposed principles for knowledge sharing. His principles emphasis on good relationship shared knowledge by training, meeting places and times to exchange the ideas and incentive for those who share knowledge etc. According to Hess (11) rural knowledge can perform better if all are agree on same objectives, interest, contribute their experience and a place to share all these.

A requirement is a necessary attribute in a system, a statement that identifies a capability, characteristic, or quality factor of a system in order for it to have value and utility to a user.   This paper further stated that 85 percent of the defects in developed software originate in the requirements. It is widely recognized that requirements gathering is vital to the SDLC process. This is because the quality of any software product depends on the quality of the raw materials that are fed into it. Thus, poor requirements lead to poor software. A special document that lists all requirements is software requirement specification, which is again helpful for documenting user requirements. The great challenge of the requirements process is finding a way to uncover and capture the needs of the business and communicate those needs to a software development team in a language and style that facilitates the software design process, producing a result that precisely solves the business problem.

## 2     Literature Review

More than of half of Pakistan's population lives in rural areas. They can have a lot of benefit of using technologies but it's worthless if it is not used for the benefits made for. Rural areas can get the more benefits from them in various fields such as in Education. ICT has become the most important tool for the increasing adoption and access of education. The adoption of education is near to the ground in Pakistan due to inadequate situations. Lack of motivation at Primary Level, lack of education at undergraduate level, lack of infrastructure, poverty and Gender Biasness are common factors which are major barriers in implementation of ICT in rural areas of Pakistan. People don't have education but they have experience. They can do well in most of fields. ICT can help them to work in a formal and best way in their working. People of rural areas have not as much of education status. All people use ICT openly or in some other way but they don't be familiar with the convention of it. They assume that usage of these technologies have terrible impact on their lives and don't know about the helpful impact of ICT in their lives. Higher the number of uneducated people lowers the quality of governance. Young people of rural areas are excluded from ICT. Rural areas users are illiterate they don't be familiar with the significance of education. We have divided our literature review into three parts:

1. Software Requirement gathering Process
2. Requirement Elicitation Technique
3. Requirement Elicitation in Rural Areas

### 2.1     Software Requirement Gathering Process

Software requirement gathering is sub domain of software requirement engineering of software engineering. It is first step of traditional SDLC.

According to [7], Gathering, understanding and managing requirements is a key factor to the success of a software development effort. There are several techniques available for requirement gathering and most of them involves customer interaction with the development team.

As discussed in [12], the most difficult part in gathering requirements is not documenting the user requirements it is the effort of helping users figure out what they 'need' that can be successfully provided within the cost and schedule parameters available to the development team. The paper further discussed Industry experience has shown that customers and system developers should jointly evaluate stated requirements to ensure that each is a verified need. It is estimated that 85 percent of the defects in developed software originate in the requirements. Once defects are embedded in the requirements, they tend to resist removal. They are especially difficult to find via testing.

Another paper [9] discusses requirements must be determined and agreed to by the customers, users, and suppliers of a software product before the software can be built. The requirements define the "what" of a software product. Business requirements define the business problems to be solved or the business opportunities to be

addressed by the software product. In general, the business requirements define why the software product is being developed. The authors mentioned various levels and types of requirement in figure 1:
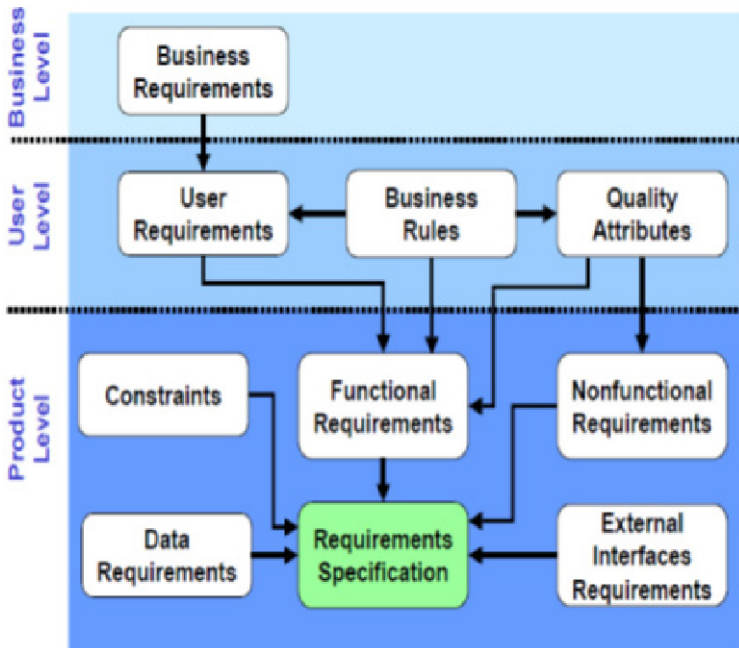


**Fig. 1.** Levels and Types of Requirements (Source: [9])

The authors further mentioned that if software requirements are not right, companies will not end up with the software they need.

## 2.2    Requirement Elicitation Techniques

Within the requirement engineering process is to use requirement elicitation and then requirement prioritization. Our aim is to discuss requirement elicitation in this section.

The main challenge of the software engineering community is to satisfy the customer needs and possibly exceed his expectations in an economic, rapid and profitable manner. Requirements engineering can help organizations develop quality software systems within time and budget constraints which are true reflection of customer needs [10]. The paper further stated that the primary success factor of requirements elicitation is that requirements meet end user needs. This outcome is difficult to achieve because users often have trouble identifying and articulating their needs and because those needs often change as a result of system implementation. Mistakes made in elicitation have been shown many times to be major causes of systems failure or abandonment and this has a very large cost either in the complete loss or the expense of fixing mistakes.

Some of the challenges discussed are: The majority of requirements elicitation techniques fail to address the less conspicuous and often more tacit requirements, priorities, and issues that analysts do not know to ask about and those users do not or cannot readily identify and articulate. Traditional techniques are unable to fully diagnose how such contextual issues will affect system requirements, system development, and system evolution. The methods to develop requirements are under the engineer's control [20]. An overall knowledge about the requirements development methods is important for engineers to predict the requirements development process and select a proper method. There are number of requirement elicitation techniques [4][10][20] available in literature.    Some of the techniques discussed by various authors are presented in table 1

**Table 1.** Requirement Elicitation Techniques

| Techniques | Details |
|---|---|
| Interviews | Conducted from groups of people with pre-defined agenda |
| Workshop, focus groups | To create/review high level features of desired products |
| Questionnaires | During early stages of requirement elicitation |
| Brainstorming | Rapidly generates broad and large list of ideas |
| Prototyping | A version of software which is incomplete |
| Win-win approach | Stakeholders negotiate to resolve disagreements about user requirements |
| Repertory Grids | To identify the similarities/differences between different domain entities |
| Card Sorting | To sort a series of cards into groups according to their own understanding |
| Joint Application Development | Stakeholders discusses the problems and all possible solutions |

## 2.3    Requirement Elicitation in Rural Areas

It is necessary to understand the current scenario of requirement elicitation in rural settings in order to know the evolving technology. The hesitation is more pronounced with the rural users because they are not exposed to new technologies.    For requirement elicitation, the author has discussed in [1], there are influential people in the villages like doctors, teachers, rich farmers and the elderly who are trusted sources of information for the village. These are the people accessible to almost all the villagers and can influence individual and collective decisions.

Much of the communication in rural areas is restricted to physically close locations, the nearby towns and villages. For this intra and inter village communication, word of mouth information exchange is most widely used. People gather at public places like local market, bus stop etc. and discuss various issues concerning them. This is also the place where social consensus is made and decisions taken. However inaccuracy is a major problem with this communication system. Most of the written communication done by the illiterate population like filling up

government forms, Insurance formalities, and even writing letters is through agents/middlemen. This can be attributed to low literacy levels, unfamiliarity with the "official" language used and lack of information resources.

In practice it is much more difficult as finding useful information implies that the actual end-users understand what the problem is and ask the 'right questions' which get the 'right answers' so that the resulting information is pertinent and applicable. Expressing oneself with the 'right questions', understanding the 'questions right', and giving the 'right answers' are all learnt skills which, because of their socio-economic situation, people in rural communities may not have had the opportunity to develop [8]. As discussed in [3], author said that the first obstacle to overcome would be the general level of computer literacy of the people in the area. Merely providing the technology will not lead to a large number of people using it, similarly training would be sufficient. Studies in rural areas in Asia showed that in the battle against poverty, micro-finance has emerged as one of the most potent weapons.

## 3 Problem Analysis

There is Lack of awareness about ICTs in villagers as they are unaware of the fact that what benefits they may reap with Technology. There are a very limited number of expected users of technology in rural areas due to many demographic, cultural and economic barriers, as many people cannot afford these expensive technologies. Also it is perceived very weird in underdeveloped and backward areas, if females use technology and latest communication conveniences like cell phones, Face book and Skype. Low literacy rate is a major cause for this conventional approach of people towards technology. Affordability of ICTs is also a major factor for less adaptation of technology, because masses living in remote areas of Pakistan mostly have poor economic conditions. Lack of technical human resource in village areas to sort out technical problems is also a major reason. Low literacy rate is a big factor, which debars people to embrace technology, as mostly kiosks and Softwares are in English language and the people only know their national or regional languages in most of the areas of the country. By reviewing literature, we observe that technology adoption is a barrier between rural and remote communities of Pakistan specifically women. It is difficult to understand the perception of messages of illiterate women. Women living in rural areas are more subject to these aspects because of more challenges like literacy, socio-economics, religion and technology. Rural woman hardly have any interaction with technology.

## 4 Methodology

The method to conduct our research will be survey based and evaluation of system for rural communities. This survey and participatory audience research will be conducted from some selected rural areas of Punjab. The expecting finding in the study will have a guideline to design an interface to meet the need of rural community. Fig 2
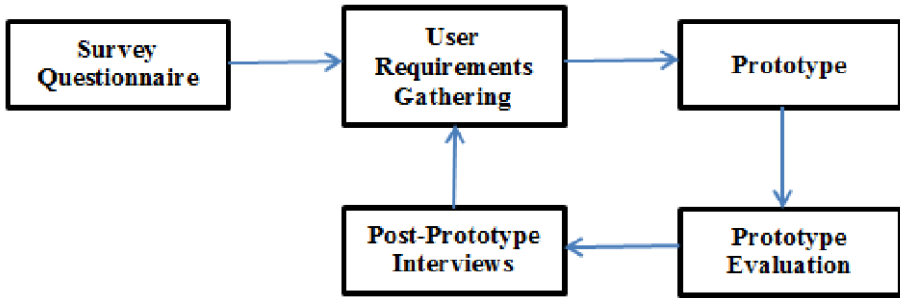
**Fig. 2.** Framework

## 5     Expected Results

Information technology may play a crucial role in improving socio-economic conditions of the far wide areas of the country; it may allow better access to the health and educational facilities in the rural areas of the country. Modern and updated Facilities are concentrated in urban areas, provision of health facilities, construction of universities and Libraries, all confined to the big cities and towns, whilst, Rural areas are deprived of all these, if provided in village, they are not sufficient or in poor condition Government and Local government started rural development program and uploaded their information about development program on websites for rural people.

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