A FRAMEWORK TO ELICIT USER REQUIREMENTS FOR INFORMATION SYSTEMS: A LOCALIZED PARTICIPATORY APPROACH FROM SOUTHERN AFRICA

Mkhululi Tyukala  
Department of Information Technology, Faculty of Engineering,  
Nelson Mandela Metropolitan University, P.O. Box 77000, Port Elizabeth 6031, South Africa  
tyukala@nmmu.ac.za

Dalena Pottas  
Department of Information Technology, Faculty of Engineering,  
Nelson Mandela Metropolitan University, P.O. Box 77000, Port Elizabeth 6031, South Africa  
dalenca.pottas@nmmu.ac.za

Mikko Korpela  
Healthcare Information Systems Research and Development Unit, University of Eastern Finland, Kuopio, Finland  
Mikko.Korpela@uku.fi

ABSTRACT  
The “What” and “Why” to do for information system development in resource restricted environments is already well covered in literature. However, the “How” to do it is still not explored. The research reported in this paper, focuses on developing a locally flavored participatory user requirements elicitation (PURE) framework for the development of information systems in resource restricted environments. It uses, existing participatory practices, user requirements elicitation (URE) literature and local participatory norms and traditions to achieve this.

Author Keywords  

INTRODUCTION  
User participation in information system design is recognised as a main determinant of the ultimate success of the system. Research on participation in information systems design has primarily been restricted to countries such as the United States and various countries in Europe. Existing literature shows that little has been done to study information systems design in African contexts where most resource restricted environments are found. Furthermore, emphasis has been placed on traditional work environments (i.e. the organizational context) and not necessarily on community contexts where the focus is on citizen engagement. Therefore, the design of bespoke information systems in African countries has depended on methods that were born from contexts that did not match the context of use which results in the system failing to address the user requirements of the local context. Recent research in participatory design (PD) emphasizes the importance of its contextual nature and concedes that there is no single best practice for PD in information systems, which applies to all contexts.

On this basis, a need arises to lay foundation towards the development of locally flavoured participatory approach for information systems development (ISD) in resource restricted environments. This will enable resource restricted environments to enjoy the benefits of information systems and decrease the chances of information system failure that results from using information systems developed for other contexts.

Finally, this paper is structured as follows. The first section contextualizes the research presented in this paper by explaining the research problem. The second section presents an overview of the research methodology employed to carry out this research, i.e. design science. In the third section the first of the theoretical background concepts, PD, is presented briefly. In the following section, URE, which is the second theoretical background concepts, is presented. To conclude the theoretical background of the concepts that make up this research, participatory African decision making mechanisms is presented in detail. In this section the concept of imbizo (Tyukala, Pottas, & Korpela, 2012a) is introduced and is explained by considering its historic role in South Africa, its usage as a community-oriented decision-making mechanism. The next section presents a framework for the proposed use of imbizo in ISD in resource restricted environments. Finally, in Conclusion, the contributions of this research are highlighted. In doing so, the new intellectual ground that the introduction of participation from local norms and traditions point of view is opening for the IS field in communities outside the business environment is highlighted.

RESEARCH METHODOLOGY  
The research methodology employed in this research is the design science research (DSR) paradigm. Particularly, it uses Hevner et al (2004) to describe design science as an IS research approach that is suitable for the development of the output of this research. This decision was motivated by the aim to develop a participatory framework to elicit user requirements in resource restricted environments.
According to (Hevner et al., 2004, p. 82), design science, a problem solving process, was introduced to the IS community in the early 1990s (Peffers et al., 2006, p. 86). It was viewed in terms of two fundamental actions namely; build and evaluate (March & Smith, 1995). According to Hevner et al. (2004), design science aims to solve practical and theoretical problems by creating new and innovative artefacts. In positioning design science within the existing methodological philosophies of information systems research, Vaishnavi & Kuechler (2012) state that it is another "lens" or set of analytical techniques and perspectives for performing research in IS.

Contributions of design science research are in the combined novelty and utility of constructed artefacts (March & Storey, 2008, p. 726). According to Hevner et al. (2004), artefacts are broadly defined as constructs (vocabulary and symbols), models (abstractions and representations), methods (algorithms and practices), and instantiations (implemented and prototype systems).

Building on the above, the output of this research combines both the model and methods types of artefacts. According to Tomhave (2005), the development of a "[...] construct that defines assumption, concepts, values, and practices, and that includes guidance for implementing itself" is defined as a framework. On this basis, the output of this research is a PURE framework for ISD in resource restricted environments.

Furthermore, Hevner et al. (2004) proposed seven guidelines to follow in DSR. The guidelines are: Design as an Artefact, Problem Relevance, Design Evaluation, Research Contributions, Research rigor, Design as a search process, Communication of research. The basis of these guidelines is that knowledge and understanding of a design problem and its solution are obtained through the development and application of an artefact. To develop the artifact, this research followed a research process as defined in (Kuechler & Vaishnavi, 2012; Takeda, Veerkamp, & Yoshikawa, 1990).

Finally, in order to develop a locally relevant PURE framework for resource restricted environments, it is important to make use of the existing knowledge in the field. In the following discussion the topics on which this research is founded are discussed briefly. It is noteworthy that both PD and URE are covered in detail in literature and previous publications (Tyukala et al., 2012a; Tyukala, Pottas, & Korpela, 2012b) on this research. As such, both concepts are presented but briefly.

PARTICIPATORY DESIGN

To cater for the lack of locally relevant participatory ISD methods, this study is using PD from published literature. The use of PD is motivated by both its widespread use as a method to include potential users of an information system as equal partners throughout the information system development cycle and its spread and adaptation (Carroll & Rosson, 2007; Reich, Konda, Monarch, Levy, & Subrahmanian, 1996; Sharp, Rogers, & Preece, 2007) to local norms and challenges around the world.

Further, the use of PD in this research is found in its principles. The fundamental principle of PD is mutual and reciprocal learning between the designers and the future users of the artefact that is being designed (Beguin, 2003). According to Gregory (2003), this is accomplished by dividing all the design stakeholders into various teams that independently design paper mock-ups of the new systems (Gregory, 2003). In the end, the best design solution is chosen. This is done by a three stage iterative process (Blomberg & Henderson, 1990). The stages are (Shneiderman, 1997):

1. The elicit knowledge about the domain;
2. The design of the user interface or prototyping;
3. Work practices and job redesign.

As such, this research aims to develop a locally relevant participatory approach founded on the above principles.

USER REQUIREMENTS ELICITATION

On the other hand, URE is used in this research as a guide and a foundation of achieving the objective of the research reported in the paper.

The aim of URE, which according to Hickey & Davis (2003) can be defined as “learning, uncovering, extracting, surfacing, and/or discovering needs of customers, users, and other potential stakeholders”, is concerned with obtaining tacit information about "what to build" from the users and their environment (Holbrook III, 1990). Further, Nuseibeh & Easterbrook (2000, p. 39) states the aim of URE is to find out what problem needs to be solved. According to them, this helps define the boundaries of a new information system. Further, Kappel, Prüßl, Reich, & Retschitzegger (2006) state, better URE leads to successful system development.

Building on the URE process described in (Kotonya & Sommerville, 1998; Rzetka, 1989), as the foundation of the PURE framework that will be developed later because it enables analysts to: (a) determine the social challenges early, (b) identify the needs of the community or the stakeholders, (c) establish if there are problems regarding communication between the analysts and the stakeholders or related issues early in the elicitation phase and (d) the processes can easily iterative should the need to get information about a certain aspect of the environment or stakeholders.

PARTICIPATORY AFRICAN DECISION MAKING

Building from the previous discussion, participatory practices are not new to Africa communities. According to Wiredu (2008), quoting the former Zambian president, Kenneth Kaunda, “[...] original African societies, before the influence of the European culture and others, operated by consensus”. As such, Kaunda continued, “an issue was talked out in solemn conclave until such time as agreement could be achieved”. This view is in agreement with Nyerere (1963), who stated that “[...] in African society, the traditional method of conducting affairs is by free discussion”. African communities have used participatory decision making as an approach to find resolutions to problems that affect those communities through community participation.

The most compelling features of this practise is the notion that all decisions are a community based activity that:
• Is not driven by wealth: everyone was heard from the chief and subject, warrior and medicine man, shopkeeper and farmer, landowner and labourer (Mandela, 2000)
• Is not driven class war: Instead, it aims to ensure peace, togetherness and responsibility in society. Traditional African societies tried to avoid all forms and manifestations of confrontation, conflicts and unhealthy competition because they are inimical to progress and stability (Dukor, 2011).
• deals with interpersonal and intercommunity issues.

The above characteristics have led to African participatory decision making practices to be adopted in other spheres of life. Political organisations have adopted this practise to engage with communities on issues that are important to the wellbeing of such communities.

In this regard, it is imperative that a participatory URE that is grounded on the norms and traditions of such communities starts by understanding existing participatory practices of those communities. In doing so, the issues that are at the core to the traditions of such communities will be used as a foundation of the proposed PURE framework. The discussion below looks at participatory decision making in the South African context. It presents a concept called imbizo.

Traditional Decision Making in the South African Society
Recent times have seen the resurrection of an age-old South African participatory decision making concept which in South Africa is known by different name but generally called imbizo. Although, there is no documented time or location where this concept originated, imbizo is a word from South Africa which is used to refer to a community gathering. The lack of documentation does not, however, affect the wide knowledge of this concept as a participatory decision making approach to problem resolution.

The principles of imbizo have seen the concept being adopted and adapted by the South African Government and also used by various community focused organisations as form of gathering and finding solutions to problems within those communities in a platform that promotes equality, between age groups, genders and stature.

From a historical point of view, imbizo is a traditional community gathering called by the leadership of a particular community to solve issues pertinent to that community (Hartslief, 2005, p. 14; Mabelebele, 2006, p. 103; Matshedisho, 2008). The purpose of such a gathering would be discussing or relaying important matters within a group or community. Further, this community gathering was convened mainly by the chief to provide a platform with the aim of resolving community challenges through engagement.

Furthermore, imbizo has found a home in politics for a long time. However, since the times mentioned above, the power of chiefs and kings has diminished significantly. The major reason for this is the changes within the political landscape that has been taking place over the last century or so. Kings and chiefs have little to no control of their subjects. Nowadays, there are various government levels below which chiefs and kings function.

From a traditional point of view, in order to solve community problems, imbizo follows a very basic process. First, it shows that there has to be a problem for an imbizo to be called. Secondly, the king calls the imbizo and all activities take place at the king’s palace. Thirdly, various people and in agreement with (Mathagu, 2010), including experts, take part in the imbizo process. Further, it is noteworthy that in this instance women are allowed to take part in the imbizo but not in the decision making process.

It is noteworthy that the participants may not agree on what decision should be taken and leave it for the king or chief to decide. Similar to the above judgment, the king or chief would take a stand and make a decision that benefits all the groups. Otherwise, people who view their treatment as unjustly would normally leave the village for another one which, if it happens often enough, may leave the king or chief with no people to lead and thus lose his power.

This is different from the government imbizo where the process has a number of extra steps which are divided into three sections namely; Pre-Imbizo, Imbizo and Post-Imbizo. For instance, the pre-imbizo phase is made up of the following steps: (a) Planning (b) Establishing a national task team (c) Role clarification (d) Budget (d) Consultation with the province and local municipality. The second phase is made up of the following steps: (a) Media liaison (b) Publicity and promotional material (c) Conducting research for an imbizo. From these steps the government imbizo, unlike the traditional imbizo of the olden days, makes use of the faster and far reaching methods to get to the communities using the media. This leads to the third phase of the government imbizo which is made up of the following steps: (a) Recording to documenting all issues discussed and (b) Monitoring programme for time management. Finally the last phase is made up of the following steps: (a) Evaluation (b) Reporting and (c) Follow-up. The noteworthy issues of this phase is the follow-up which deals with going back to the community to give feedback about the decisions taken by the government regarding the issues raised at the imbizo.

During our research we came across another type of participatory approach called Letsema which is an adaptation of imbizo. The word letsema is a Sotho word which describes the communal practice of doing things as a collective. This approach is used by a South African non-governmental organization (NGO) to help communities uplift themselves by working as a collective. The NGO achieves its goals by following the five steps to initiate a project in a community. Namely: Firstly, they have adopted a “get to basics” approach to dealing with community issues. They look at what resources and capacities are located in the community which can be used to effect change. Secondly, they adopt approaches
that are relevant for and rooted in the traditional cultural practices of the communities they are working with. Thirdly, they utilise an interactive processes like role playing, mapping and visioning, to determine community concerns and develop solutions. Fourthly, they make attempts to involve not only community structures and institutions, but also ordinary members within the communities in which they work.

It is noteworthy the above is not an exhaustive list of African decision making mechanisms and as such there is no doubt in the minds of the authors that there may be other forms or adaptations of the concept of imbizo. However, they cannot be all looked at once. Further, it is recognised that decision making mechanisms other than imbizo are used in different African cultures, a broad generalisation of African cultural practises is not appropriate given the need to address the contextual nature of PD.

RESULTS: THE AFRI-PURE FRAMEWORK

The characteristics that form part of the Afri-PURE framework can be summarised as follows:

1. **Community Engagement (CE)** – Identify people(s) in leadership positions that make it possible to gain access to the rest of the community and understand its overall view from its leaders.

2. **Identify Strengths (IS)** – Identify things within the community that can be used to solve the problem that may be identified in the following step. Strengths can come from the individual members of the community or from the community itself (example: buildings).

3. **Problem Definition (PrD)** – Identify the problem for which URE elicitation will be conducted.

4. **Objective Setting (OS)** – Describe of the problem to be solved including why the system is necessary and the constraints on the system.

5. **Identify Areas of information flow (IA)** – Identify the areas where activities take place in the community.

6. **Participant Selection (PS)** – Identify the individuals that are familiar and reflective of the local community.

7. **Dreaming the Future (DF)** – Allows the participants to share their ideas about how the problem could be solved. This is done by starting from individual ideas and reconciling the individual ideas into one solution through consensus making. The dreams must within the constraints identified in step 4.

8. **Communal Elicitation (CoE)** – Elicit the requirements about the activities of the community from the participants.

9. **Consensus Making (CoM)** – Make decisions throughout the PURE process as a group for the benefit of the whole community.

10. **Documentation (D)** – Document all the activities and the user requirements in order for verification and the next stages of the URE process.

Furthermore, a number of stakeholders have to take part in the execution of the steps of the Afri-PURE framework. In the context of this study, there four types of stakeholders that form part of the PURE process. The stakeholders are: (a) the community members (b) the community leaders (c) the system analysts and (d) external donors. Each of these stakeholders plays a distinctive yet important role. Further, each of the stakeholders can be internal or external to the community.

The community member (CM)s, which are the main users of the new system, participate in identifying the problem, areas of information flow and the elicitation of user requirements of the system with the system analyst(s). The community members play a role in the elicitation process by defining the problem at hand. They also play role in the gathering and finalisation of the user requirements.

The community leaders (CL) provide link and access between the external stakeholders and the community. The donors and systems analysts are the external stakeholders in context of this research. Furthermore, as they have the overall knowledge of the community and the interaction of its activities, community leaders are available to provide a clearer picture when community members are not able to do so.

System analysts (SA), from the traditional system analysis viewpoint, gather user requirements from the development of the new information system. Furthermore, where applicable, the system analyst provides status report to the external donors.

External donors (ED), in the context of this research, where applicable, provide funding for the development of the new information system. It is noteworthy that not all information system development projects are funded by external donors. Therefore, this stakeholder may or may not play a role during the elicitation of the user requirements.

Participants (P) are all the individuals from the community members and community leaders that take part in the elicitation process. It is noteworthy that participants do not take part in the elicitation process until after participant selection has taken place.
On that basis, the aim of the research reported in this paper was to develop a locally flavoured PURE framework for ISD in resource restricted countries.

To achieve the above aim, this research introduced the concept of participation from the local point of view. One of the methods introduced is an age old participatory method called imbizo. As a result a number of variations of imbizo were highlighted. Further, the research emphasized that imbizo is not presented as a substitute to existing participatory methods but rather an addition to address the lack of participatory method founded on local norms and traditions that speak to the ordinary people instead of the business environment people that PD was founded with in mind. Similarly, research on the adaptation of PD in other environments has also been premised with such business environment people in mind.

The research continued by developing a framework in the form of a model and a method on how to use it. The model was evaluated for its utility in order to conform to the design science guidelines for the development of an artefact.

Following this, the research demonstrated how the objectives identified were achieved and how the research questions were answered.

In short, this paper contributes to the existing body of knowledge by developing a new method to perform URE based on local norms and traditions. As a consequence it brought imbizo to the mainstream academic audience. This we believe is the first step in answering the call to develop local information systems using local flavoured methods that research has been calling for. We also hope that the participatory design research community will recognise the significance of this expansion of its domain, encourage and adopt it.

REFERENCES


