

Providing Market Information for Ethiopian Farmers: Extending Participatory Design

Amanuel Zewge

Adama Science and Technology
University; azewgee@gmail.com

Yvonne Dittrich

IT University of Copenhagen
ydi@itu.dk

Rahel Bekele

Addis Ababa University
rahtesf@yahoo.com

ABSTRACT

In a developing country like Ethiopia, marketing of agricultural products is influenced by local, socio-economic, cultural and IT infrastructure characteristics. ICT-based agriculture information systems have been proposed to support farmers with market information. However, such initiatives have often failed to provide useful information in an adequate form for farmers in remote areas. Participatory Design (PD) assumes to be effective approach to overcome these challenges. However, due to its origin in the western countries, the capability of users, motivation and desire to participate and availability of resources are often taken for granted. This work identifies challenges for applying PD in rural Ethiopia and proposes method for 'Early-Stage' of PD.

Author Keywords

PD, ICT for Development, Agriculture, Arenas for participation

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

BACKGROUND AND MOTIVATION

The developing world needs reliable information and knowledge on agricultural issues in easy to access and in a well-communicated manner. On its own, providing information is not enough: Information needs to be tailored to different stakeholders. Specifically, to make good decisions about farming and participate equitably and effectively in increasingly competitive markets, farmers need information supporting them in deciding what to grow, and where, how and when to market. Farmers in isolated rural areas are often lacking this information. They often are unaware of the value of their crops in central market places. They find themselves in a poor position when negotiating middlemen, who routinely downtick the final selling price and overstate transaction costs. Farmers may also be unaware of strategic opportunities within their own region – which crops and commodities are fetching higher prices in surrounding towns and which products are in high demand.

In Ethiopia, the government aims at supporting people in rural areas with agricultural advice and education through extension offices. These extension offices do often not function satisfactorily, as the personnel suffer the same adversaries –lacking physical and information and communication infrastructure – as their clientele. In

response to the aforementioned challenges, several developing regions around the world have introduced information systems for agriculture (Demiryurek, 2010; Islam et.al, 2007).

One of the most recent trends in employing ICT to support society is based on the cooperation between social sciences and computer experts (Basole, 2008). However, the necessity of cross-disciplinary research comes with significant methodological challenges. In particular, the issue of how outcomes from social, cultural and rural development studies can be interpreted and translated into design of new technology needs to be addressed. Computer science and software engineering has tools to build software artefacts and continuously improve them, but generally it has little or no tradition in understanding the social context, which is necessary to shape an artefacts' design from a socio-technical perspective. Coyne (2010), promotes methods of research that engage with narrative and socially situated ethnographic studies, rather than transportation of phenomena to the laboratory.

PD can bring together field-study methods and participative design activities to facilitate the creation of a common language between designers and users. Methods and techniques such as future workshops, case-base prototyping, and cooperative prototyping were developed to provide users with means to take an active part in technical design. However, these methods, tools, and techniques are not without limitations (DePaula, 2004). To this end, in our ongoing research, we want to explore the use of Participatory Design (PD) for agriculture market information system in the Ethiopian context. we formulated two research questions: *What are the challenges to develop agriculture market information system for farmers in Ethiopia? And how can techniques from the fields of participatory design be extended to develop information system for use by rural framers?*

PD for RURAL DEVELOPMENT REVIEW

In developing countries, various projects have been designed and evaluated with the context of a rudimentary market information service, with a particular focus on delivering services such as price information, improve market transparency, and increase liquidity in commodity markets. An example from India is the E-Choupal (<http://www.echoupal.com/>). IT supports the community with (Internet) kiosks, which are managed by farmers themselves, to enable the agricultural community to access information on the weather and market prices. Similarly, Ethiopian Commodity Exchange (ECX) is introduced to facilitate the trading between farmers and distributors and/or consumers in Ethiopia. Farmers sell their product (especially coffee) directly to the exchange

through designated brokers. Several other developing countries also introduced information systems to support their agricultural sectors: e.g., Kenya ((KACE), <http://www.africa-platform.org/sites/default/files/>); and electronic marketing across 16 African countries (e.g. Esoko, <http://www.esoko.com>)

ICT4D has in many cases failed at least partially (Dodson et al., 2013; Maail, 2011; Heeks, 2008). There are many complex reasons for this, but one factor is the lack of beneficiary participation (Walton et al., 2011). The majority of ICT4D projects continue to be externally-driven and technology-centered rather than community-centered.

Dearden et al. (2008) presented a comparative review of participatory approaches in IS design and participatory approaches to development. The review demonstrates that even if participatory design techniques such as storyboards and mock-ups are used, ICT projects are operating at risk because many core design concepts may be determined before engaging with the community.

Additionally, much of the research and many debates have originated in western contexts, with only limited and peripheral contact with developing country settings. Although some attempts to extend PD research to developing country domains have recently become noticeable (see Puri et al., 2007) for an example), the adaptation of PD in these settings has not been given much research attention. Also Winschiers (2006) argues that PD must go beyond the involvement of users in the design of the product, but should include an appropriation of the design process itself to new cultural contexts.

Pre-Study SETTING AND ANALYSIS METHODS

In order to grasp the current challenges of farmers in Ethiopia with respect to agriculture information sharing, the first author conducted pre-study. Relevant data on the sample areas was collected and three weredas were selected from the Arsi Zone namely: *Tiyo, Hetosa* and *Dodota*. The three weredas have traditionally a strong farming presence and represent the majority of Ethiopian agricultural areas. A total of 90 randomly selected farmers, 30 from each of these three Weredas were interviewed. In parallel, a total of 12 agricultural development agents and 15 agricultural experts were interviewed.

The questionnaire was designed to collect demographic data, sources of information for agriculture, current practices of information access, attitude and behaviour towards modern agricultural practices, extent of technology uptake, existing familiarity and usage of mobile phones, among others. While in the field, we visited the Ministry of Agriculture, its regional office, and NGOs. Also a number of discussion sessions with government officials, information service workers and users and non-users of information services were organized.

A triangulation of both quantitative and qualitative analytical techniques was used for the analysis of data. One of the results of the pre-study is the decision to focus the research and design presented here on market information. In the following section, we re-analyse the

data and field material as a base for the appropriation of PD methods for rural Ethiopia.

ARENAS FOR ACTOR ANALYSIS

The design of a complex system is usually not bounded to one place. It rather relates to and involves heterogeneous organizations and actors. Strauss et al. (1985) define social arenas as a field of interaction between different collective entities. Clarke (1991) emphasised that Arena analysis not only involves identifying the participants in the relevant social arenas, their distinctive perspectives and the nature of their interactions, but also how agendas are set and power is exercised across social arenas. This in turn, helps system designers better understand and define their own space for action. Gärtner et al. (1996) and Balka et al. (2008) distinguished three major arenas of participation, namely: designing work and systems; designing organizational frameworks for action; and designing the industrial relations context. In each of these arenas, interconnected heterogeneous actors participate collectively in the construction of norms and technologies. In the following we use the arenas to group the actors that did appear in the pre-study material in order to identify specific challenges and devise PD methods and their adaptation. Statistical data on the farmers' situation is based on the survey implemented in the pre-study.

Arena A: National Policies

Agriculture is one of the most important sectors of national governance as farming provides the basis for livelihood and development of the whole society. Policies for subsidy and lending money; formational regulations; Agricultural Produce Marketing (Regulation); Agricultural Produce (Grading and Marking); and Growth and Transformation Plan (GTP) along with its implementation policy are examples of the legal background supporting the agricultural area. A proper legal framework is required to regulate and monitor trusted information collection and dissemination with respect to pricing and cooperative marketing. The decisions made in the national arena affect the arrangements of system design and participation at community level. Example of actors in this arena includes: Ethiopian Ministry of Information and Communication Technology (EMICT); the Ethiopian Ministry of Agriculture (MOA). Especially, the Agriculture Transformation Agency (ATA) was established by law to assure the commitment of the governments to implement these reforms.

Arena B: Rural development

The Ethiopian government addresses rural development at a wereda level through so-called extension offices that bringing together various experts addressing a range of developmental issues including farming, livelihood and health issues. These extension offices cooperate with research and governmental and NGO development actors. A new strategy to collect and disseminate trusted agriculture information needs to involve these actors. Awareness creations and facilitation of farmers' participation strategy should be also anchored here in order to assure sustainability of the solution.

The two major actors in this arena include: **Agricultural extension officers**, who implement the government

policies. In order to monitor the farm practices periodically with the aim of forwarding remedies if anomalies occur, they look for ways to ensure that useful information is repackaged and disseminated in the right format and preference of all stakeholders. To this end, extension officers need appropriate contents and are interested in effective communication with other stakeholders and fellow-up extension workers. **Suppliers of the farm inputs** are interested to disseminate information on chemicals (e.g., fertilizer, pesticides) and seeds that they provide. They would like to establish a robust relationship with farmers and extension workers with the aim of deciding on the quality and quantity of agro-input materials required. Input supplier also would like to get loan from financial institutes through the coronation of the extension office.

Arenas C: Farming and marketing context

This is the arena where agriculture market information system needs to be designed, implemented and used.

Agriculture in Ethiopia is characterized by small and marginal **farmers** owning small and scattered landholdings. As a central problem, the interviewed farmers highlighted their dependency on local traders collecting goods and reselling it in the local centres and/or nearby town. Marketing in the study area is heavily relying on intermediaries. The results showed that 13 % of respondents sold their harvest at local villages and 70% at nearby marketing place.

The ICT infrastructure in rural areas is very limited. 62% of the respondents lived without electricity, which also implies the lack of landline telephony. 87% of the respondents, though, are the owners of a mobile phone, and 68% own both radio and mobile phone. However, 27% of the users of mobile phone reported that they have serious technical problems to use the full service of it. One of the reasons might be the limited level of education among farmers: 46% of the respondents of the survey did not receive any formal education. Due to these characteristics of the communication infrastructure, information about market prices is communicated orally. The farmers reported that they are relying on their local social network.

Transportation and logistics costs are mentioned as another major constraint. About 86% of the respondents used animals (like Donkey) to deliver farm products to the marketing place. In a specific case, the products reach the market in an average of four hours walk.

Lack of access to market information and cumbersome transport of goods does not allow the farmers to compare prices and puts them in a difficult position when bargaining.

Farmers also expressed their interest to use ICT for sharing the lessons learned with other farmers, present their produces, initiate trading, bargain on prices and sell. Moreover, farmers wanted to evaluate and analyse the services of cooperative unions with the aim of selecting the ones that match their preference and product characteristics.

The **cooperative farmer unions** in turn need to publish the details of their services in a way that can be accessed by farmers, and monitor and manage their clientele

(farmers). The task of **development agents (DAs)**, local representatives of the extension offices, is to support farmers with knowledge on crops, soil treatment, farming practices and pest and disease handling.

Traders and brokers want to get enough information to purchase desired quality of product at competitive prices. They also need to announce the details of the services they provide. Their interest is the lowering of transaction cost by being able to purchase predictable quantity and quality. **Retailers** are looking for better quality of product and want to share their need with local traders and farmers.

This arena is subject to influence from the above two arenas. For instance, to introduce information sharing, challenges related to trusted market price data collection and dissemination needs to be resolved using decisions and regulations from the organizational and national arenas (Arenas A and B).

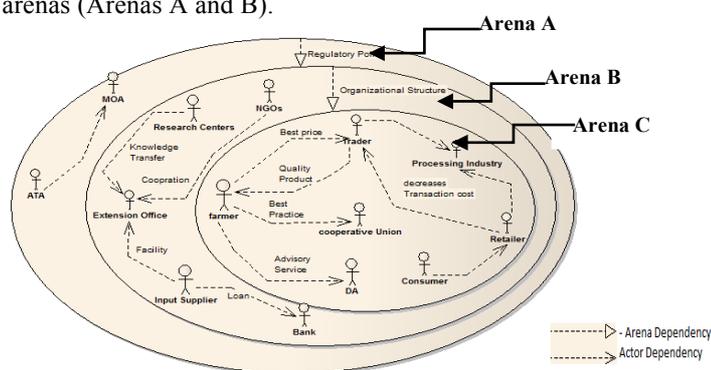


Figure 1: Arena and Actor interdependency

METHODS FOR PD AT 'EARLY-STAGE'

Based on the pre-study reported above, a project has been initiated to design and prototype an information system providing farmers with the possibility to share market and price information, allowing for dissemination of governmental pricing information, and in a second stage providing access to an online trading platform.

To this end, Iteya, a wereda close to the regional capital three villages from one kebele of this wereda has been identified for the design and the pilot implementation. A baseline survey has been implemented in order to be able to later evaluate the impact of the participatory design and the prototype implementation. Below we describe the next steps in the PD process we plan to undertake in the next post-harvest period.

Identifying specific participants for identified actors above

The generic identification of actors related to the different arenas presented above needs to be complemented by the identification of specific persons representing the actors in Iteya. The first author identified the wereda and the kebele in discussion with the central actor in the rural development arena. Participants from this arena can be identified by snowballing based on identification of relevant persons by the extension officer collaborating with the project. Similarly, relevant persons to involve including relevant actors on Arena A, the agriculture policy arena can be identified that way and by contacting relevant governmental agencies.

Inadequate involvement of the intended beneficiaries has been identified as one major cause of project failure.

Involving participants representing actors from the local farming and marketing arena (Arena C) requires more consideration: The three villages in the selected kebele have 230, 170, and 280 households. Involving a member of each household in the PD process is neither appropriate nor practicable. So the selection of genuinely representative individuals is a crucial issue. The participating farmers need to be able to contribute relevant knowledge to the project and be able to represent the project in their communities. To this end, we begin with identifying a group of interested farmers in a village representing the different language, and each of these farmers is asked to recommend other farmers (based on snowball concept) with individual farmer as a node and link as their recommendation (relation). Likewise, a new farmer is asked to do the same. As a process continues, a group of farmer under study builds up farmer-social-network in the kebele. To fix the numbers of participants for PD, we used his/her role and social-connection with other farmers in each village and then took those farmers who have the higher value of inter-connectedness.

Arena C: Farming and marketing context

To successfully carry out PD at the community level, we above identified challenges that need to be addressed one way or another. We cluster out these ideas in four categories: awareness creation; *collaborative design*; *scene setting workshop*; and *'identification of scenarios*. First and for most any ICT4D researcher needs to have a preliminary understanding of current situation through field visit and – as in our case - a baseline study in the rural context. It is important to obtain data on contextual factors like, socio-cultural, technological, and economic and ICT use factors in the target area. These factors will guide workshop agendas, design and development process. At the same time, the gathering of this kind of data creates awareness in the farming community about the project. This can be supported by *awareness creation* sessions informing about the proposed system. This could be done by relating to model farmers or representatives, discussing with these local champions in the participatory approach. This in turn creates a room for the community to follow the footprints of these people as a good practice.

To strategically enable all participants' involvement in the participatory design process, we should consider the where and how of the intended *collaborative and participatory design*. These includes: first, the *place of meeting*. There are several options: each kebele has a farmer training centre (FTC). Farmers have habit of visiting the FTC. However, the according to the development agents, the farmers' attendance of FTC-meetings is not always as high and regular as they would prefer. Also the pre-study showed that farmers use to gather at nearby village for social meetings. So the first participatory decision might be on where the meetings and workshops should take place. The second point to consider is the *competence of the participants*. The discussions at the meetings need to use the language of the participants. Technical terms need to be carefully defined and explained. As mentioned above, in many villages several ethnic and language groups live together. The meetings need to be organised so that all participants can formulate their contribution using their own language. In Iteya and its kebeles, about half of the

farmers have Amharic respectively Oromiya as their first language. As a third issue, we would like to highlight *Transparency and power sharing*. The different actors involved in this arena, farmers, development agents and traders all have different and partly conflicting agendas. Even farmers themselves can be competing with each other. Hence, the participation process needs to be transparently structured to motivate early involvement of participants. Participation implies power sharing and requires room for free flow of ideas between participants. In this situations people can become observers of their own thinking and arguing, which is a basis for changing behaviour and learning. If conflicts of interest show up, arguments might be a way to achieve consensus, but many other means like, negotiation and mediation could also be used as well. The goal is to develop an environment for discussing controversial issues on a level field to facilitate mutual-learning in the PD process.

We propose a *scene setting workshop* as start of the concrete PD process. The idea here is that, people are knowledgeable about their own situation and needs: so establish ways for this knowledge to be shared and communicated to inform the design of technology at the centre of the workshop. Participants' participation in a workshop has to be designed in a dialogue form that gives everybody the opportunity to set the agenda and contribute to problem analysis, visioning, and the definition of priority areas for the design. Kensing et al. (1992) designed exemplary workshop formats, Future Workshops, and Mørch et al. (2004) is recently adapted it. It has three stages: critiquing the current system, envisioning the future, and steps towards implementation (moving from the present towards the envisioned future).

The purpose of the future workshop is the *identification of scenarios*. Scenarios will help to establish discussions between the stakeholders and the anticipation of the impact of the technology and the behaviour of actors in the social setting. Scenarios bring together visions of future states and paths of development in a systematic way. They are meant to enable participants to build internally consistent picture of future possibilities and to envisioning the implications of contingent developments. Scenarios in this case might have the form of simple diagrams or drawings not unlike rich pictures (Checkland, 1981) with no special formalism as the participants in the workshops typically have no experience with technical descriptions using IT oriented formalizations. As a tools brainstorming, group discussion and traditional forms of communication, such as song, video, pictures, theatre, and cartoons could be used to develop a scenario.

The development agent working with the wereda would be a natural participant in the workshops. Based on the initial scene setting workshop and the scenarios, we plan to include other local actors in the participatory design.

Arena B: Rural development

Currently the agriculture sector in developing country is hierarchically structured and administrated from top- to down (i.e, MOA-to-Kebele) with legalized means and communication procedures. Using this line of communication will assure governmental officials that participation in the project is part of their tasks and motivate them to engage in the project. This in turn

creates space for discussion along the administration chain and with other actors. The actors in this arena need to be informed and engaged in the participatory designed activities with farmers, DAs and traders. Participation of the extension officer in the beginning of the kick-off and scene setting workshop will contribute to confirm the mandate of the local design constituency.

Arena A: National Policies

The Ethiopian Government has approved the national ICT4D policy as a framework, which targets the development of information and a knowledge-based society. In light of this, our project is in line with the governmental agenda that support farmers with up to date information on marketing and pricing. The project will contribute to the national policy in two ways: it will provide a design for the functionality and interface towards the intended beneficiaries and it will help to develop a methodology for design with farmers to support rural development with ICT in Ethiopia. In order to assure the alignment of the project with the agriculture related policy making, we plan to keep contact to relevant actors on the national level.

CONCLUSION

ICT4D as a research area is concerned with exploring the role of ICTs for alleviating developmental constraints. PD provides set of methods and techniques to involve users in the design of technology. However, in ICT4D project participation needs to move away from the workplace to include members of communities as well as public agencies with heterogeneous agendas. The capacity of the intended users to participate in the design needs to be explicitly addressed. Ethiopia with its variety of languages, ethnic group, and low level education in rural areas necessitates the development of adapted participatory design approach. To this end, we proposed methods for 'Early-Stage' of PD. The project provides a unique possibility to evaluate and expand PD method to fit with ICT development for under privileged communities.

ACKNOWLEDGEMENT

Thanks to the farmers in the three wereda for their time, motivation to participate in the pre-study. Thanks also to the EMOA, EMICT, wereda agriculture officials, development agents and members of NGOs for sharing their visions and plans for the agricultural sector.

REFERENCES

- Balka, Ellen, Pernille Bjorn, and Ina Wagner. "Steps toward a typology for health informatics": Proceedings of the 2008 ACM conference on Computer supported cooperative work. ACM, 2008.
- Basole Rahul C. "Enterprise adoption of ICT innovations: multi-disciplinary literature analysis and future research opportunities." Hawaii International Conference on System Sciences, Proceedings of the 41st Annual. IEEE, 2008.
- Checkland Peter: Systems Thinking, Systems Practice, Wiley 1981
- Coyne, Richard. The tuning of place: sociable spaces and pervasive digital media. The MIT Press, 2010.
- Clarke, Adele E. "AS ORGANIZATIONAL THEORY." Social organization and social process: Essays in honor of Anselm Strauss (1991): 119.
- Dearden, Andy, and Haider Rizvi. "Participatory IT design and participatory development: a comparative review." Proceedings of the Tenth Anniversary Conference on Participatory Design 2008. Indiana University, 2008.
- Demiryurek, Kursat. "Information systems and communication networks for agriculture and rural people." Agric. Econ.–Czech 56.2010 (2010): 5.
- DePaula, Rogério. "Lost in translation: a critical analysis of actors, artifacts, agendas, and arenas in participatory design." Proceedings of the eighth conference on Participatory design: Artful integration: interweaving media, materials and practices-Volume 1. ACM, 2004.
- Dodson, Leslie, S. Revi Sterling, and John K. Bennett. "Considering failure: Eight years of ITID research." Information Technologies & International Development 9.2 (2013): pp-19.
- Electronic Agriculture marketing across African countries (Esoko).<https://esoko.com>. Accessed April 2014
- Gärtner, Johannes, and Ina Wagner. "Mapping actors and agendas: political frameworks of systems design and participation." Human-Computer Interaction 11.3 (1996): 187-214.
- Heeks, R. "ICT4D 2.0: The next phase of applying ICT for international development." Computer 41.6 (2008): 26-33
- Islam, M. Sirajul, and Åke Grönlund. "Agriculture market information e-service in Bangladesh: A stakeholder-oriented case analysis." Electronic Government. Springer Berlin Heidelberg, 2007. 167-178.
- Kenya Agriculture Commodity Exchange (KACE): <http://www.kacekenya.co.ke>. Accessed on: April 2014
- Linking Indian rural farmers via the Internet (E-choupal): <https://www.echoupal.com>. Accessed on: April 2014
- Kensing, Finn, and Kim Halskov Madsen. Generating visions: Future workshops and metaphorical design. L. Erlbaum Associates Inc., 1992.
- Maail, Arthur Glenn. "User Participation and the Success of Development of ICT4D project: A Critical Review." (2011).
- Mørch, Anders., Engen B., Åsand H. "Introducing E-Learning in a Norwegian Service Company with Participatory Design and Evolutionary Prototyping Techniques." Conference on Workplace Learning (WL 2004), 25-27 November 2004.
- Puri, Satish K., and Sundeep Sahay. "Role of ICTs in Participatory development: An Indian Experience." Information technology for Development 13.2 (2007): 133-160.
- Strauss A, Fagerhaug S, Suczek B, Wiener C. Social Organization of Medical Work. Chicago: University of Chicago Press, 1985.
- Walton, M., and R. Heeks. "Can a process approach improve ICT4D project success." Manchester: Development Informatics Group, Institute for Development Policy and Management (2011).
- Winschiers, Heike. "The Challenges of Participatory Design in a Intercultural Context: Designing for Usability in Namibia." PDC. 2006.