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Abstract

Farmers living in rural villages of Sri Lanka do not have proper access to information to make informed decisions about their livelihoods and as a result they face constant hardships in their lives. They use mobile phones to communicate but these are not currently connected to the Internet. We are investigating how to provide personalized information to farmers with the aim of empowering them to make informed decisions and take appropriate actions. In this paper we propose an empowerment model that has been designed to achieve their goals which have been identified using a scenario-based approach. The model examines several empowerment processes and supporting tools that would help them to achieve their goals with the hope that they would have an increased sense of control, self-efficacy, knowledge and competency. This empowerment model is applied to the development of a mobile based information system that is being developed by an international collaborative research group to address the issues of the farmers.

Keywords

User empowerment, developing countries, self-efficacy, mobile based information system

INTRODUCTION

Empowerment is a concept linked to power. It has been defined as the "ability to get what one wants, and the ability to influence others to feel, act, and/or behave in ways that further one's own interests" (Dodd and Gutierrez 1990, p. 64) and "the capacity to exert control and influence over decisions that affects one's life space for one's own benefit" (Zimmerman 2000, p. 44). Many researchers have described empowerment as an iterative process of gaining such power (Speer and Hughey 1995; Masterson and Owen 2006; Wallis, Dukay, Mellins et al. 2008). Empowerment has different meanings in different sociocultural and political contexts, typically involving the use of terms such as self-efficacy, control, self-power, self-reliance, independence, making one's own decisions, and being free to define it (Narayan 2002). Empowerment is of intrinsic value and can be applied at the individual and collective levels. In its broadest sense, empowerment is the expansion of freedom of choice and action. It means increasing one's authority and control over the resources and decisions that affect one's life. As people exercise real choice, they gain increased control over their lives.

Information and Communication Technologies (ICT) have been found to bring many positive benefits and have impacted many areas in developing countries. For example, numerous projects have been launched to support the farmers in developing countries including: e-Choupal project in India that delivers farming information to farmers' mobile phones (Radhakrishna 2011), 8villages business project in Indonesia that delivers information to farmer's mobiles using the social network concept (Vaswani 2012), and Rural and Agricultural Development Communication Network (RADCON) project in Egypt that uses an interactive community-based information network to help meet the information and communication needs of rural farmers (UNICEF 2011).

Despite these successful projects, none of the approaches offered explicitly address empowerment or how to motivate the targeted users to utilise the technology to its full potential. Access to information itself is not enough, the technology and supporting processes and environment must be aligned to the needs and characteristics of the farmer.

In our internationally collaborative project (discussed further in background and next steps sections) we will investigate whether the provision of relevant and timely information using a Mobile Based Information System

(MBIS) to farmers in Sri Lanka leads to an increased sense of empowerment (Ginige, Ginige and Richards 2012). Farmers need applications to enhance their livelihood activities. MBIS applications need to provide information on rapidly changing dynamic situations such as fluctuations in market prices, prevailing supply and demand situations for their produce as well as more stable information such as information on seeds, pests, weather patterns and soil types. We propose a number of empowerment activities in MBIS to enable farmers to receive the information that they need to make their own decisions, become independent, pro-active, empowered and improve their livelihood. Therefore the system that we are developing is not only to provide information to the farmers but also empowerment activities for them to act on, making it different to other systems reported in the literature.

In this work-in-progress paper we present our investigation into developing empowerment activities within the MBIS using a scenario based approach. The next section presents background information relevant to the current situations of farmers, followed by an introduction to empowerment theory and related work involving empowerment studies. We then present the research process that we have used to develop the empowerment activities and the proposed empowerment model. The last section contains next steps and conclusions. The appendices contain the scenarios and analysis material used to develop the empowerment model.

BACKGROUND

Due to the rapid growth of the mobile telecommunications industry over the last three decades, billions of people in developing countries are gaining access to modern communications of some sort for the first time (Union 2010). Currently, 90% of the world's population is covered by a mobile signal, 76% of the world's population has a mobile subscription and in developing countries the subscription rate is 67% (Union 2010). Social networks that provide us with tools to share our experiences using text and a variety of other mediums have become popular during last few years. With the second generation of Web 2.0 applications, today users not only view the content but also add content. They can use micro-blogging to communicate and can attach photos and videos to it. Users who were previously passive information consumers have become the information producers which can be seen as an empowerment of previously passive information consumers (Cormode and Krishnamurthy 2008). The micro-blog concept has made it possible to use mobile phones to access social networks. Today mobile phones are equipped with a touch keyboard, range of sensors such as cameras, GPS, and have the ability to run applications like music players, photo albums, etc.

The success of current social networks and the explosive growth of mobile applications and mobile devices with myriads of sensors have enabled users to be socially connected while they are mobile. Jain et al (Jain, Sing and Gao 2011) have shown that the next generation of social networks can be designed not only to connect people to share information and experiences, but also to connect people with others and essential information resources by making use of this array of sensors. He refers to these new networks as Social Life Networks (SLN). By analysing technology usage and applications, Jain et al, (Jain, Sing and Gao 2011) show that there are about 3.5 billion people who have mobile phones but are not part of the modern Internet due to lack of useful applications.

In the Sri Lankan economy, agriculture is one of the important sectors and approximately 33% of the total labour force is engaged in agriculture (Agriculture 2011). Farming rice, vegetables or other crops is the most important activity for the majority of people living in rural areas of Sri Lanka. Currently there are not many mobile applications that have been developed to address the local needs of the farmers. Depending on the crop cycle there will be different information needs. There are six stages of a crop cycle: *deciding* stage where farmers decide what to grow, *seeding* stage where farmers either purchase or prepare seeds, *preparing and planting* stage, *growing* stage where farmers apply fertiliser, pesticides and water, *harvesting, packing and storing* stage and *selling* stage (De Silva and Ratnadiwakara 2010). Farmers often make wrong decisions due to the lack of access to current and relevant information. For example, during the deciding stage, farmers often choose to grow the same crop within a region, and this could cause a potential over supply of crops (Hettiarachchi 2011). Farmers only come to know, or realise, there is an oversupply when they bring their harvest to the market, and the oversupply reduces market price for the crop, disadvantaging the farmers. Neither the farmers nor government agencies are able to make the necessary adjustments for lack of timely information regarding what farmers plan to cultivate, or have cultivated. The yield could be affected by various other factors including availability of water, weather, and pests. There are similar issues at all the stages of the crop cycle (Lokanathan and Kapugama 2012).

Most farmers depend on their self-knowledge, friends, family and sometimes a village middle-person for advice and information that may not be accurate, up-to-date or complete (Lokanathan and Kapugama 2012). Farmers who have a small quantity of produce find it difficult to find a good space in the market to sell their produce as the farmers who produce large quantities dominate the market space. Often the middle-person takes advantage of these situations as farmers do not have enough information to carry out successful negotiations. This leaves

farmers feeling powerless, helpless and desperate, and they do not see their livelihood is improving. In the past, some very unhappy farmers have attempted to commit suicide in desperation (Senaratne 2005). Some farmers have stopped farming and have started to look for other jobs.

The main objective of the proposed MBIS is to address some of these issues by providing relevant, timely information that they need. Further it will have empowerment activities that would help them to get involved in activities that are meaningful to them in their own environment, to learn new skills, be knowledgeable, competent, independent, and achieve their goals. The aim of the International Collaborative project is to provide this essential information to farmers (SLN4mop 2012). The specific aim of this work within this framework is to investigate how farmers can be empowered to act on this information.

EMPOWERMENT THEORY

Empowerment has many definitions. Mechanic (1991) has defined it as "an intentional, ongoing process centred in the local community, involving mutual respect, critical reflection, caring and group participation, through which people lacking in equal share of valued resources gain greater access to and control over those resources" (Mechanic 1991). Group (1989) has defined empowerment as "a process where individuals learn to see a closer correspondence between their goals and sense of how to achieve them, and a relationship between their efforts and life outcomes" (Group 1989) . Both of the above definitions define empowerment as a process which has outcomes.

Empowerment theory provides a framework that helps to organise the knowledge needed to create strategies to support the development of empowerment. The theory suggests that actions, activities or structures may be empowering, and the outcome of each process results in a level of being empowered (Zimmerman 1988). A thorough development of empowerment theory requires exploration and description at multiple levels of analysis such as individual, organisational and community. Applying this general framework to community level analysis, empowerment may refer to collective action to improve the quality of life in a community and to the connections among community organisations and agencies. This can provide the basis to investigate how users can form into communities similar to the "group" concept in current Social Networks. In empowerment theory, empowering processes and their outcomes are clearly defined. Empowering processes for individuals might include learning decision-making skills, managing resources and working with others. Empowering processes for communities might include being able to access government agencies, media and other community resources. Possible outcomes of individuals feeling "empowered" would be situation specific perceived control, critical awareness, skills and proactive behaviours. For communities, empowerment outcomes might include the evidence of pluralism, the existence of organisational coalition and accessible community resources.

In their model of empowerment Stacki and Monkman (2003) demonstrate the obstacles and facilitators that exist as people participate in a variety of contexts as they move from the private sphere to the public sphere (personal /family /work /community /institutional /national /global). As people exercise their human agency either individually or collectively, they interact with the forces that can either create obstacles or facilitate their efforts. Processes that promote situation focused education and develop awareness can result in three forms of responses or actions: accommodation, resistance or change. When people accommodate and resist, change does not happen. Empowerment can occur when people proactively seek change (Stacki and Monkman 2003).

Cattaneo and Chapman (2010) provide researchers with an empowerment process model that may help to understand and promote this change. One of the important components of this model is defining personally meaningful, power oriented goals. Studies have shown that understanding the nature of such goals and how they differ across people and contexts is critical to facilitating the process of empowerment (Kieffer 1984; Kroeker 1995). When describing empowerment, researchers often identify an individual's beliefs about his or her abilities, their sense of value or self-worth and self-efficacy as core elements of the empowerment process (Riger 1993; Kroeker 1995; Cattaneo and Chapman 2010). Many studies have revealed consistent evidence linking self-efficacy to motivation and performance across situations and cultures, at both the individual and community levels (Bandura 2002). Bandura further indicates the influence that social context has on self-efficacy. In particular, the opportunities, obstacles, and resources in one's environment have obvious impacts on one's beliefs about what one can accomplish.

After identifying a goal and feeling that one can accomplish it, one must identify a course of action. In this model, (Cattaneo and Chapman 2010) define knowledge as an understanding of the relevant social context, including the power dynamics at play, the possible routes to goal attainment, the resources needed, and ways to obtain them. Learning skills to accomplish a task will increase self-efficacy and promote action, and experience with taking action will refine skills, further influencing self-efficacy and action (Kieffer 1984; Zimmerman 1995). The impact component of this model is considered as the assessment of what happened after an action is taken. The reflection on impact will help to understand the obstacles to success such as discrimination, lack of

resources, revealing related knowledge and leading to refinement of goals. This is the component of the model in which the role of social context is most explicit (Cattaneo and Chapman 2010).

In the context of domestic violence, (Li, Richards, Smith et al. 2012) have done a feasibility study to examine the use of intelligent, online advisory tools to address the informational needs of domestic violence victims. The study explores how an online advisory system based on empowerment theory can help a domestic violence victim to make well-informed decisions. Their proposed empowerment model supports processes to provide personalised information to the victims. Providing facts and alternatives to a victim assists him/her to make an informed decision to take an action. Circumstances of every victim is different, therefore understanding their individual situations and providing them with personalised information may help them to become more knowledgeable about their situation, that may help them to feel confident to take an action in their lives.

RESEARCH APPROACH

We have adopted a scenario-based approach to design an empowerment model and empowerment processes and tools to be embedded within a Mobile Based Information System for Sri Lankan farmers. Scenario-based design is a set of techniques in which the use of a future system is described at an early point in the development process (Rosson and Carrol 2002). Narrative descriptions of envisioned usage episodes are then employed in a variety of ways to guide the development of the system that will enable the user experiences. Scenario-based design has a user-focused approach and focuses on how users will use a system to accomplish their work tasks from which functional specifications can be derived.

In an organisation, when designing a new system or improving an existing system, users can specify the functional requirements of a system clearly. As they have used such systems before, it is easier for them to identify the drawbacks, issues and inefficiencies to suggest new requirements. However this is not the case for most farmers who live in rural villages of Sri Lanka. They are not exposed to seeing or using such systems. Therefore, it is difficult for them to specify what the functional requirements of a system would be. However, because of the hardships that they experience, they are aware of the issues in their lives. Therefore, we have chosen to discover how farmers carry out their day-to-day tasks and the issues they face through existing narrative descriptions. We reviewed approximately 15 scenarios of Sri Lankan farmers in desperate and powerless situations from online newspapers (Senaratne 2005, Sunil 2012, WSWS 2011, Gunasekara 2012). Many of the issues and themes were similar and three different groups were identified. One representative narrative description was selected from each group. These scenarios are summarised in Appendix A. Analysis of these scenarios (see Appendices B-D) has helped us to understand current issues and farming practices. It has also given us an insight into what their personalised goals might be.

With that knowledge we have transformed the scenarios (see Appendix E) to identify the changes that need to happen for them to achieve their personal goals. As most of the farmers have similar issues in their lives, we were able to find a similar set of goals in all three scenarios. The next step was for us to design empowerment processes that would help them to achieve their goals. We have identified a set of activities that need to happen in these empowerment processes. These activities have been integrated into the tools in the Mobile Based Information System architecture that has been previously designed.(Ginige, Ginige and Richards 2012). With the knowledge that we have gained from empowerment theory, other empowerment studies and the scenario based approach that we have used, we were able to design an empowerment model for the MBIS.

PROPOSED EMPOWERMENT MODEL

The proposed empowerment model for farmers is shown in Figure 1. Analysis of the scenarios, summarised in Appendix A, have helped us to identify possible life **goals** of the farmers to: have a secure job, have financial security, access to information to make informed decisions, perceive alternative solutions, learn new skills, access education, feel safe, create disaster recovery plan and become an active community member. Our scenario analysis is summarised in Appendices B-D. Next we have identified possible **empowerment processes** that may assist them to achieve these goals: decision making, planning and managing resources, learning and disaster recovery. These are discussed further when the tools to support them are described.

To design and measure the empowerment processes we must consider the **empowerment outcomes**. Applying empowerment theory and previous studies to our scenarios we identified four empowerment outcomes: *sense of control*, *increased self-efficacy*, *increased knowledge* and *competence*. (Bandura 1997) suggests that an individual's *self-efficacy* beliefs influence the choices made and the actions pursued. They should be able to see the resources that would assist them and the path to take to access these resources (Cattaneo and Chapman 2010). Access to personalised information and learning tools will increase their knowledge and competency and allow them a greater sense of control and self-efficacy.

To facilitate achievement of the empowerment outcomes we used the scenario transformations in Appendix E to identify of a number of **tools to support empowerment activities**:

- *Personalised Information* will make farmers feel their problem has been identified, valued and provided them with assistance in solving their own problems. This would help them to increase their self-efficacy belief that they should be able to achieve their goals by their own efforts in their own environment.

- *Discussion* tool will help farmers to discuss their issues with the other farmers and exchange ideas, become aware of new ideas and alternative solutions. This would help them to become an active member of their community and potentially achieve all four empowerment outcomes.

- *Profit calculator* will help them to understand total expenses in their farming activities and expected income hence the expected profit. With this knowledge of the expected profit, they will be able to make an informed decision about what actions they should be taking. This knowledge will help them to avoid future financial disasters. If a farmer does not know how to calculate expenses and expected income, they can learn this skill prior to using the profit calculator through e-learning.

- *Planning and scheduling* is a tool that would assist them to create, plan and organise their own personal and community activities. If a farmer decides to purchase a particular type of pest control chemical, the user could participate in an online *discussion forum* before buying and make an informed decision in the end.

- The *online ordering* tool will help the users with activities that are related to business transactions and banking processes. The *Profit calculator, planning and scheduling* and *online ordering* tools will improve the farmer's business skills and support the empowerment outcomes of sense of control and self-efficacy.

- *eLearning* will provide new skills and techniques to facilitate the empowerment outcomes of increased knowledge and competence. *e-learning* is defined as instructional content or learning experiences delivered or enabled by electronic technology (Gallaher 2002). A study done by (Sharma, Dick, Chin et al. 2007) states that e-learners with higher intrinsic goal orientation and self-efficacy are likely to have better e-learning course performances. Depending on the goal of the farmer they can choose appropriate learning modules that will provide them with new skills and allow them to set even higher self-efficacy goals.

- A *disaster recovery plan* will be most useful for rural farmers that would enable them to develop their own mechanisms in their environment to deal with disasters, such as death in a family, illness, droughts or floods. We note that even though currently few farmers have Internet-enabled telephones, they are currently available at low prices and if having access was seen to be valuable, we believe Internet uptake would increase. This will support the empowerment outcome of sense of control and self-efficacy.

- *Idea box* is a tool that would help farmers to suggest their own ideas and increase their self-efficacy. For example, farmers may suggest that they want to learn how to create an expense and income sheet that would help them to use profit calculator tool better. This interaction will help farmers to let the system developers know about the users' needs and also for the system to learn from the environment.

In Figure 2, we have extended our High Level Logical Architecture for MBIS .(Ginige, Ginige and Richards 2012) to support the activities in these empowering processes with tools including a discussion forum, profit calculator, e-learning, idea box, planning and scheduling, online ordering and disaster recovery modules.
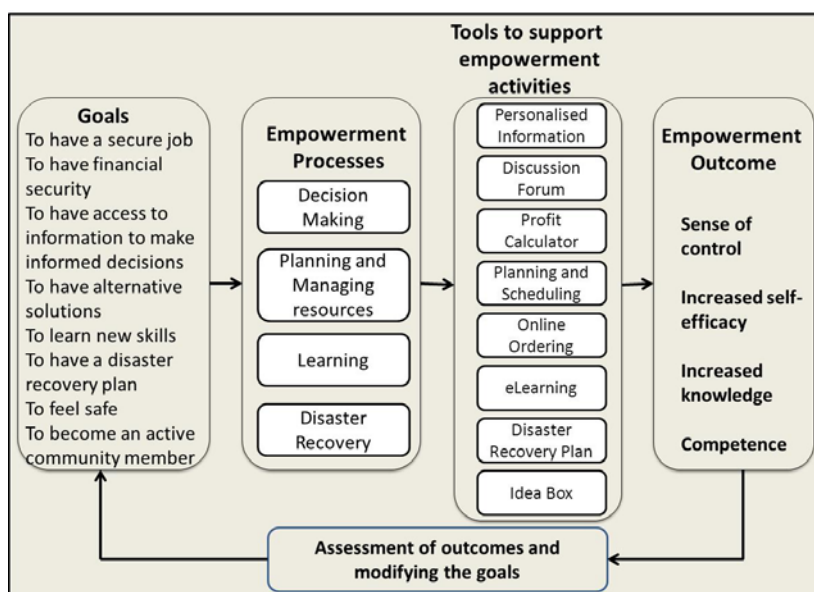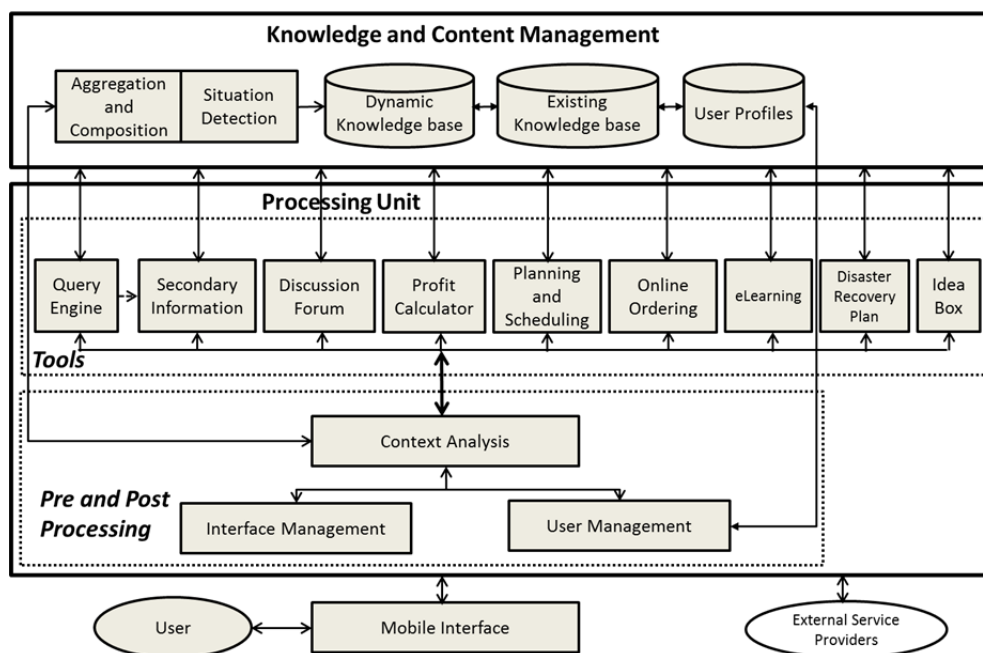

Figure 1: Proposed Empowerment Model for Farmers

Figure 2: High level Logical Architecture for MBIS extended with tools for empowerment

NEXT STEPS & CONCLUSION

Currently Sri Lankan farmers are facing many issues due to lack of information to make informed decisions relating to their livelihood activities. Though some of this information is available on government websites and from agricultural officers, so far farmers have not made effective use of this information. There are two aspects to make effective use of this information. The first aspect is to get the information to farmers. The second aspect is to empower the farmers through making the best use of that information.

To investigate these issues an international collaborative research project has been started to implement a Mobile Based Information System to provide farmers with timely, relevant and personalised information and to assist them to make best use of the information to improve their livelihoods. The collaborating Universities are University of California Irvine in USA, University of Colombo in Sri Lanka, University of Salerno in Italy, and University of Western Sydney (UWS) and Macquarie University in Australia. The Sri Lankan team is investigating the information needs and possible ways to generate this information (Silva, Goonetillake, Wikramanayake et al. 2012). The UWS team is investigating how the agriculture domain knowledge related to Sri Lankan farmers can be organised by developing an ontology and querying it in the context of farm location, time of the year, climatic and soil conditions (Ginige, Ginige and Richards 2012). The Italian team is investigating the research issues related to development of the mobile user interface for this application (Giovanni, Romano, Sebillo et al. 2012). The USA research team is developing the micro information aggregation framework required to implement this architecture (Jain and Sonnen 2011).

At Macquarie University we are investigating how to empower farmers through empowerment processes within the MBIS. As the next step of our investigation of the empowerment model, we are in the process of developing the profit calculator. This tool will be tested for usability with the farmers in Sri Lanka. From the insights that will be gained, the development of the profit calculator and the empowerment model will be refined. This iterative process will be repeated for the other tools in the proposed empowerment model.

In this paper we have analysed a set of typical scenarios and identified what is needed to convert some of the negative outcomes in these scenarios to positive outcomes. We have identified that farmers need personalised information in the context of their own situation and tools for them to act on this information. Based on this we have presented an empowerment model with empowerment activities that will enable them to make their own decisions, become independent, pro-active, empowered and improve their lives.

REFERENCES

Agriculture. (2011). "Department of Agriculture Govenment of Sri Lanka."   Retrieved 28/11/2011, from http://www.agridept.gov.lk/.

Bandura, A. (1997). "Self-efficacy: Toward a Unifying Theory of Behavioral Change " Psychological Review **84**(2): 191-215.

Bandura, A. (2002). "Social cognitive theory in cultural context." Applied Psychology: An International Review **51**: 269-290.

Cattaneo, L. B. and Chapman, A. R. (2010). "The Process of Empowerment: A Model for Use in Research and Practice." American Psychologist **65**(7): 646-659.

Cormode, G. and Krishnamurthy, B. (2008). "Key Differences between Web1.0 and Web2.0." First Monday **13**(6).

De Silva, H. and Ratnadiwakara, D. (2010). "ICT Policy for Agriculture Based on a Transaction Cost Approach: Some Lessons from Sri Lanka." International Journal of ICT Research and Development in Africa (IJICTRDA) **1**(1): 14.

Dodd, P. and Gutierrez, L. (1990, p. 64). "Preparing students for the future: A power perspective on community practice." Administration in Social Work **14**(2): 63-78.

Gallaher, J. M. (2002). "The adoption of e-learning across professional groups in a Fortune 500 company." Doctoral dissertation, University of Illinois at Urbana_Champaign: 128.

Ginige, A., Ginige, T. and Richards, D. (2012). Architecture for Social Life Network to Empower People at the Middle of the Pyramid. UNISCON 2012 – 4th International United Information Systems Conference. Yalta, Ukraine, Springer.

Giovanni, P. D., Romano, M., Sebillo, M., et al. (2012). Building Social Life Networks through Mobile Interfaces– the Case Study of Sri Lanka Farmers IX Conference of the Italian Chapter of AIS (ITAIS 2012). Rome, Italy.

Group, C. E. (1989). Empowerment and Family Support. Networking Bulletin. **1:** 1-23.

Gunasekara, S. (2012). "Large scale waste at Dambulla Economic Centre   " Retrieved 9th of July, 2012, from http://www.lakbimanews.lk/index.php?option=com_content&view=article&id=1344%3Alarge-scale-waste-at-dambulla-economic-centre&Itemid=56.

Hettiarachchi, S. (2011). Leeks Cultivators Desperate as Price Drops to Record Low. Sunday Times. Sri Lanka.

Jain, R., Sing, V. and Gao, M. (2011). "Social Life Networks for Middle of the Pyramid." from http://ngs.ics.uci.edu/whitepapers/SLN_whitepaper%20110212.pdf.

Jain, R. and Sonnen, D. (2011). "Social Life Networks." IT Professional **13**(5): 8 - 11.

Kieffer, C. H. (1984). "Citizen empowerment: A developmental perspective." Prevention in Human Services **3**(2): 9-36.

Kroeker, C. J. (1995). "Individual, Organizational, and Societal Empowerment: A Study of the Processes in a Nicaraguan Agricultural Cooperative " American Journal of Community Psychology **23**(5): 749-764.

Li, M., Richards, D., Smith, S., et al. (2012). "An Online Advisory System to Empower Victims of Domestic Violence." Communications of the Association for Information Systems **30, Article 3**.

Lokanathan, S. and Kapugama, N. (2012). Smallholders and Micro-enterprises in Agriculture. Knowledge-based Economies. Colombo, Sri Lanka, LIRNEasia.

Masterson, S. and Owen, S. (2006). "Mental health service user's social and individual empowerment: Using theories of power to elucidate farreaching strategies." Journal of Mental Health **15**(19-34).

Mechanic, D. (1991). "Adolescents at risk: New Directions." Seventh Annual Conference on Health Policy **12**(8): 638-643.

Narayan, D. (2002). Empowerment and Poverty Reduction: A Sourcebook.

Radhakrishna, R. (2011). e-Choupal transforms Indian agriculture. Appropriate Technology. **38**.

Riger, S. (1993). "What's wrong with empowerment?" American Journal of Community Psychology **21**: 279-292.

Rosson, M. B. and Carrol, J. M. (2002). Scenario-Based Design: The Human Computer Interaction Handbook, Lawrence Erlbaum Associates.

Senaratne, G. G. (2005). "More rural suicides in Sri Lanka." Retrieved 9th of July, 2012, from http://www.wsws.org/articles/2005/nov2005/suic-n21.shtml.

Sharma, S., Dick, J., Chin, W., et al. (2007). "Self-Regulation and E-Learning." 383-394.

Silva, L. N. C. D., Goonetillake, J. S., Wikramanayake, G. N., et al. (2012). Towards using ICT to Enhance Flow of Information to aid Farmer Sustainability in Sri Lanka. Australasian Conference on Information Systems (ACIS 2012) Geelong, Australia, Australasian Assocaition for Information Systems.

SLN4mop. (2012). "Social Life Network for Middle of the Pyramid." Retrieved 11th of July, 2012, from www.sln4mop.org.

Speer, P. W. and Hughey, J. (1995). "Community organizing: An ecological route to empowerment and power." American Journal of Community Psychology **23**: 729–748.

Stacki, S. L. and Monkman, K. (2003). "Change Through Empowerment Processes: Women's stories from South Asia and Latin America." Comparative and International Education **33**(2): 173-189.

Sunil, W. A. (2012). "Sri Lankan farmers demonstrate for a higher rice price." Retrieved 9th of July, 2012, from http://www.wsws.org/articles/2012/mar2012/slfm-m27.shtml.

UNICEF. (2011). "Communication for development:Strengthening the effectiveness of the United Nations."
from http://www.unicef.org/cbsc/files/Inter-agency_C4D_Book_2011.pdf.

Union, I. T. (2010). "Measuring the Information Society." Retrieved 14th of Nov 2011, from
http://www.itu.int/ITU-D/ict/statistics/.

Vaswani, K. (2012). "Indonesian farmers reaping social media rewards." BBC News: The Technology of
Business Retrieved 8th of July 2012.

Wallis, A., Dukay, V., Mellins, C., et al. (2008). Power and Empowerment:Fostering effective colloborations in
meeting the needs of OVC. Tanzania, Laundy Foundation.

WSWS. (2011). "Sri Lanka: Thousands of farmers protest against new law." Retrieved 9th of July, 2012, from
http://www.wsws.org/articles/2011/dec2011/slfa-d21.shtml.

Zimmerman, M. A. (1988). "Citizen participation, perceived control and psycological empowerment " American
Journal of Community Psychology **16**(5): 725-750.

Zimmerman, M. A. (1995). "Psycological Empowerment: Issues and Illustrations." American Journal of
Community Psychology **23**(5): 581-600.

Zimmerman, M. A. (2000, p. 44). Empowerment Theory : Psychological, Organisational and Community
Levels of Analysis. New York Kluwer Academic/Plenum Publishers

Appendix A: Scenarios of issues and current practices of Sri Lankan farmers

Actor for scenario one: Bandara is a 40 year old farmer who lives in a village near Polonnaruwa in Sri Lanka. He studied up to Advanced Level class in school and can read and write well in his native language. He uses a basic mobile phone for voice communication and to receive market prices. Sometimes he sends SMS too. After his schooling period, there weren't any other jobs available for him to take up. Therefore he chose paddy farming even though he knew he could not earn enough money to live.

Scenario One:(Senaratne 2005; Sunil 2012) Bandara's land is 2.5 acres that produces 2,500 kg of paddy. The government buys only 500Kg/acre and the maximum amount that he can sell to the government is 1250 Kg. When selling to the government, Bandara must meet the buying standards of the government such as the moisture content which must be lower than 14% and there should not be any black seeds. Sometimes, even if he satisfied the buying standards of the government, it takes a while for him to receive a cheque for his sale. When he cannot sell his paddy to the government, he has to sell it to the private traders who pay him very low prices. Bandara does not have money to buy fertilizer and chemicals at the beginning of crop cycles. He buys them from private traders on loan basis at higher prices. After he sells his paddy he pays off some of these expenses, he does not have enough money to live. He borrows money from private money lenders and as a result he has become more indebted to private traders and money lenders. Private money lenders charge exorbitant interest rates of 30% to 50% for a 5-6 month growing season. They collect the proportion of the crop equivalent to the money loaned, plus the interest just after the harvest.

Actor for scenario Two: Anura is a 35 year old farmer who lives in a village near Dambulla in Sri Lanka. He is a tomato grower who has a good knowledge on how to grow tomatoes. He had to stop studying at school due to economic difficulties at home. He and his brothers were compelled to farm on a rented land as there was no other alternative. He can read and write well in his native language and can speak and understand some English too. He likes using his basic mobile for communicating and keen to learn the new technology.

Scenario Two:(WSWS 2011; Gunasekara 2012) Anura and his brothers' farm on rented land and they need to pay a higher amount for the rent at the end of the season. He cannot get a loan from the state bank as they need at least Rs50,000 ($500) fixed deposit account, or the land deed as security for the mortgage, both of which they do not have. Anura does not have a prior knowledge of market conditions. Often there is an over-supply of tomatoes at the market and when that happens he cannot sell the tomatoes at a reasonable price. As he cannot afford to transport back his unsold produce to the farm, he has no other choice except to dump it at the bins in the market. Recent introduction of a new law to transport vegetables in plastic crates has made his situation worse. Earlier he used sacks to transport his tomatoes. With the new law, he needs to spend 830% more money to transport his produce to the market.

Actor for scenario three: Shanthi is a 35 year old widower and a mother of two young children. She lives in a village near Welikanda. For generations, her family has been paddy farmers. She went to school and she can communicate well in her native language. She got married young and supported her husband in farming activities while raising her family. Unfortunately her husband who was a paddy farmer committed suicide as he could not pay off the money that he borrowed. Shanthi does not own a mobile phone and does not know how to use it. But her husband had one and she knows that a mobile phone is used to talk to others.

Scenario Three:(Senaratne 2005) Since her husband committed suicide, Shanthi does not have a proper income now. Sometimes her neighbours give her some assistance. Shanthi is hard working and she starts to grow

vegetables and fruits in her backyard. But she does not have a very good knowledge of farming activities. As she owns the paddy field, she wants to lease it to other farmers. Sometimes other farmers take advantage from her situation by bargaining the price on the lease. Because of the lack of a proper income, she fears that she may not be able to send her children to school for long as she cannot afford these expenses.

Appendix B: Scenarios Analysis – Claims of Scenario One

Situation Features	Pros (+) and Cons (-)	Change needed
Farmer chooses farming as a job.	(+) Farmer is employed. (-) Paddy farming is not his choice.	Job satisfaction
Farmer buys fertilizer and chemicals at the beginning of crop cycles from a private trader on a loan.	(-) Farmer goes in to debt. (-) Farmer does know about other ways to buy fertilizer and chemicals without going in to debt.	Financial security, access to information to make informed decisions, personalised information, alternative solutions community support
Farmer sells his paddy to the government.	(+) Farmer receives a good price for some of his paddy. (-) Farmer cannot sell his entire paddy to the government. (-) Farmer is trapped in poverty.	Financial security, access to information to make informed decisions, alternative solutions
Farmer sells his paddy to the private trader.	(-) Farmer is forced to sell some or his entire paddy to private traders at a lower price. (-) Farmer has lack of knowledge on other traders and market conditions. (-) Farmer is trapped in poverty.	Financial security, access to information to make informed decisions, alternative solutions

Appendix C: Scenarios Analysis – Claims of Scenario Two

Situation Features	Pros (+) and Cons (-)	Change needed
Farmer chose to grow tomatoes on a rented land.	(+) Farmer uses his wealth of knowledge that he has gained over the years to grow tomatoes. (-) Farmer's knowledge on how to grow tomatoes may not be up-to-date, accurate or complete. (-) Farmer pays a rent for the land at the end of the season.	Access to information to make informed decisions, Financial security Personalised information Alternative solutions
Farmer takes his produce to the market when the supply of tomatoes is high which is unknown to him.	(-) Farmer does not know market conditions beforehand. (-) Selling price goes down. (-) Farmer dumps unsold tomatoes at the market. (-) Farmer does not know alternative solutions (-) Wastage of tomatoes. (-) Farmer feels anxious, angry and frustrated that he could not sell his produce well.	Access to information to make informed decisions, personalised information, financial security, alternative solutions
The government introduces a new law to use plastic crates instead of sacks to transport vegetables.	(+) Vegetable and fruit wastage due to poor transportation methods may be reduced by 5% - 40%. (-) Farmer cannot afford high transportation costs introduced by transport traders. (-) Farmer does not know alternative, cheap and efficient packaging methods.	Financial security, access to information to make informed decisions, alternative solutions

Appendix D: Scenarios Analysis – Claims of Scenario Three

Situation Features	Pros (+) and Cons (-)	Change needed
Shanthi is a single mother.	(-) Helpless family in emotional trauma (-) No proper income for the family to survive (-) Children may stop going to school	Disaster recovery plan, financial security, community support personalised information
Shanthi grows vegetable in her backyard.	(+) helps to feel she in some control in her life. (+) Uses her limited knowledge of farming in practice. (+) Brings a little income to the family. (-) Lack of knowledge of farming may not bring a good outcome to the family.	Education, access to information to make informed decisions, alternative solutions
Shanthi leases her paddy land to other farmers.	(+) Brings some income to the family. (-) need to deal with social issues relating to a young, widowed woman having to deal with other men	Safety and security, alternative solutions, personalised information

Appendix E: Scenario Transformation

Negative Claim	Possible positive outcome via empowerment activities in MBIS
Scenario One: (-) Farmer is forced to sell some/ entire paddy to private traders at a lower price. (-) Farmer has lack of knowledge on other traders and market conditions. **Scenario Two:** (-) Farmer does not know market conditions beforehand.	Farmer sends a query to the proposed MBIS to find out the traders who can buy his paddy. The query searches the dynamic knowledge database to provide aggregated, real-time information about the traders, the type of paddy they buy, selling price and geographical locations. Farmers can access the discussion board and enquire about the experiences that other farmers had dealing with a particular trader, different transport mechanisms and associated costs.
Scenario One: (-)Farmer does know alternatives to purchase fertilizer and chemicals without going in to debt. (-) Farmer trapped in poverty.	When farmers need to buy fertilizer and chemicals, they can pool their resources to buy them in bulk. They can plan and coordinate these activities as a community activity to help each other rather than seeking assistance from a private money lender.
Scenario Two: (-) Farmer cannot afford to take unsold tomatoes back to the farm.	Farmer can query the existing knowledge base of MBIS to get advice on the type of transport mechanisms available, cost of transport and availability of pooled transportation facilities.
Scenario Two (-) Farmer's knowledge on how to grow tomatoes may not be up-to-date, accurate or complete.	When a farmer sends a query to MBIS via their mobile phone, MBIS can recognise the location of the farmer. Dynamic knowledge-base of MBIS can provide an indication of how many other farmers would be growing the same type of tomatoes and other types of crops that are grown in that area and by how many farmers. The system can also provide other necessary information that is helpful for a particular stage. For example; in a deciding stage of a crop cycle, information on weather conditions, high yield crops and crop diseases. That would give a farmer the choice of deciding whether to continue with growing tomatoes or choose a new crop to grow in a season.
Scenario Two (-) Farmer does not know alternative, cheap and efficient packaging methods.	Via discussion forums, local farming community can start to discuss their ideas about how to find a sustainable solution to packaging problem. They can start using their ideas to build relationships with other organisations to find a reasonable solution.
Scenario Two (-) Farmer does not know alternative solutions other than selling tomatoes (-) Wastage of tomatoes.	At selling stage, farmers can query MBIS to know about other traders who use tomatoes for secondary functions such as making tomato sauce/juice/paste. This will help a farmer to decide whether to sell all of his tomatoes or sell it to a trader for secondary purposes.
Scenario Three: (-) Helpless family in emotional trauma (-) No proper income for the family to survive (-) Children may stop going to school (-) Lack of knowledge on farming may not bring a good outcome to the family. (-) need to deal with social issues relating to young, widowed women having to deal with male farmers.	MBIS can assist farmers to organise activities that would help them to deal with situations such as a death in a family, sickness and natural disasters such as drought and floods. MBIS can provide them with some knowledge on how to create community groups and disaster recovery plans. For example farmers can subscribe a small percentage of their income to a farmer's group towards such situations. Discussion forums can be used for brainstorming to find solutions to these situations. They can use an online, anonymous voting system to nominate their leaders without bias. That gives community groups the power to find the solutions in their own environment. Power of such community groups would help men and women to feel that they are not isolated and minimise disruptions to their livelihoods.

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