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Research paper

Agent Oriented Requirement Engineering: A Case Study of Training the Trainer

Cheah WaiShiang[1], Loh CheeWyai[2], Sim YeeWai[2], Nurfauza bt Jali[1]

[1]*Faculty of Computer Science and IT, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia*
[2]*School of Computing, University College of Technology Sarawak, Lot 868 Persiaran Brooke, 96000 Sibu, Sarawak,*

Abstract

Techniques such as interview and natural language elicitation are widely used for needs analysis, particularly in the modelling of software in Borneo. However, these approaches are often inadequate as they are subject to biases in interpretation by either the knowledge engineer or subject experts. Natural language specification tends to be overly flexible. It is also subjected to the perception and interpretation of the reader and writer. On the other hand, the interview process is always influenced by IT experts' perception. Understanding requirements is an important study for ICT4D as most existing software has been targeted for a larger audience. This subjective approach is however, error-prone and could even lead to a failure of projects. We introduce an alternative approach to elicit the requirement of the rural community in Borneo through an agent-oriented models, AOM. AOM presents the requirements at a higher level of abstraction and supports social engagement across various stakeholders. We introduce process, models as well as a detail case study on training the trainer programme (ICT for transformation) in Bario, Sarawak. The models have provided insights into community needs and thus facilitating the design of IT training program that addresses their concerns.

Keywords: Agent oriented requirement engineering, training, ICT4D

1. Introduction

Techniques such as interview and natural language elicitation are widely used for requirement study, particularly in understanding the needs of the rural community, Sarawak. It is the first activity in software development lifecycle whereby it collects the users' needs, constraints and services prior to application design and implementation and thereby enhances the acceptance of a system by users. However, these approaches are often inadequate as they are subject to biases in interpretation by either the knowledge engineer or subject experts. Meanwhile, the natural language elicitation lead to ambiguity due to unclear questionnaires or answers were given. Although use case diagrams are used during requirement analysis, it is always technology driven. In this case, the use case diagrams present the functionality of the systems or technology without looking into the dependency of the use case across various stakeholders and the needs of the users. For example, the use cases for promoting the community products online consists of login, publish a product, handle payment, check in and check out, registration, handle promotion, handle inventory. The use cases do not reflect the actual activities in which considerations are needed on production, market survey and promotion, the supply of raw materials, logistic, the financial practice of community. Consequently, it leads to the inadequacy of the eCommerce project as stated in[6].

Inline with the work by Jaap[7] to propose a new method of enterprise application, we argue that there is a need for a new method when working on requirement engineering study for ICT4D. This paper is our continue efforts to introduce agent-oriented modelling in ICT for development (ICT4D). Agent-oriented modelling (AOM) is a modelling technique that is introduced by Sterling and Taveter[2]. The agent-oriented modelling is used to model a complex socio-technical system, a system that involves the interaction of various entities like human, software, hardware and environment. Goal model, role model, domain model, interaction model, behaviour model, scenario model, knowledge model are introduced when modelling a complex socio-technical system through AOM.

In this paper, we propose the use of goal model and scenario model[3][4][8] to reduce this gap. To the best of our knowledge, this is the first work to introduce agent-oriented modelling on ICT4D. Works like[1][3][4][6][8] adopted AOM on collaborative games, sustainable software, serious games, crisis management system, business modelling and etc. Section two presents proposed modelling of ICT requirements through agent models. The agent oriented requirement engineering is elaborated with a walkthrough example of adopting the proposed solution in IT training program. The evaluation of the proposed solution is presented in Section three. Also, the paper is concluded in Section three.

2.0 AGENT ORIENTED REQUIREMENT ELICITATION

Figure in abstract shows the proposed processes for agent oriented requirement engineering. The requirement study starts with

viewpoint identification through eHOMER. This is followed by viewpoint structuring through ROADMAP goal modelling; viewpoint restructuring through i* goal model. Finally, we involve in viewpoint system mapping through scenario model. In this case study, we do not focused on system design. Hence, we do not use interaction model, knowledge model and behaviour model in this case study. The details description of each process is elaborated in the following sub-section through a case study of empowerment programme for Bario community.

Viewpoint Identification

We conducted an interview with the site leader of Bario and IT group members to understand the role of the community by using the HOMER approach. The elicitation answers are shown as following.

Table 1: Simplified elicitation answers for empowerment programme in Bario

Interviewee	Role	Task(s)
Interviewee 1:	Worker	I need this training to get a job in Miri, perhaps in the future.
Interviewee 2:	Village secretary	1) I need to fill in the form for my committee member. For example, if I need to apply for government relief for one of my family members, the applicant must know how to fill in the digital form, and how to attach the digital photo. Resizing the photo is needed for application submission. I need to know how to fill in the form and attach the photo to email and send my request to the government agency. In addition, how do I know the result of my submission? 2) I need to type in my minutes and send to the government agency for budget approval, how can I do that?
Interviewee 3:	Farmer	I need IT so that I can record and calculate my daily, weekly and yearly sales.

Viewpoint Structuring

Figure 1 shows the goal model of the potential ICT usage for development. Modelling the potential usage of the ICT applications for a target group is part of the activity in viewpoint structuring. From the Figure 1, we can elaborate that the main goal is to develop the ICT for a rural community. In general, ICT4D has been introduced to achieve various goals to improve the socio-economic conditions of the Bario community. The ICT application has addressed goals representative of the main community focus. These include 'Preserve culture', 'enhance lifestyle', 'access to external services', 'empowerment or promote community learning', 'handle decision support'. In other words, ICT application can be used to improve the agriculture management, health management, business management, welfare management, environment protection and disaster management, government services, culture and education for the Bario community. Towards achieving a goal, the participatory involvement of particular group within the community will be required. For example, the service provider, policy makers and villagers are the key people in ICT development for the Bario community; the empowerment of stakeholder can then be assessed by the teacher and student.

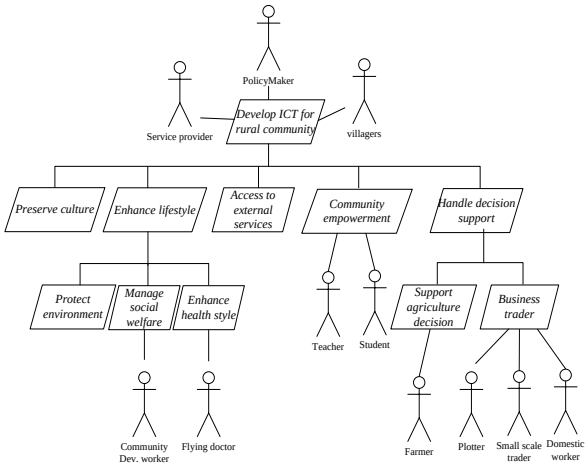

Figure 1: Goal model for modelling the potential usage of ICT4D for Bario

Viewpoint Restructuring

Viewpoint restructuring is done by interacting with the site leader in order to discover the most significant ICT usage of ICT applications. This can be done by going through the viewpoint identification again to collect the community needs on IT training through elicitation questions. Then, we will further detail the models accordingly. This is important to reduce the failure of the application in the community.

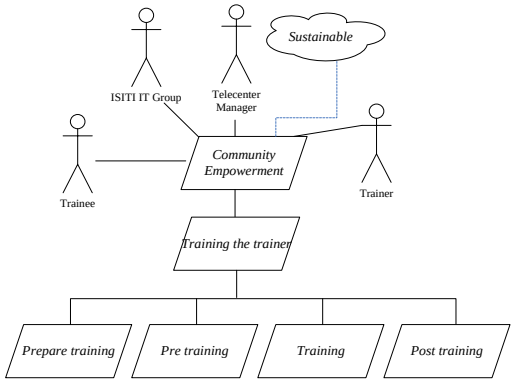

Figure 2: Goal model to present the focused ICT usage in Bario, empowerment programme

Figure 2 shows the extended goal model for achieving the main purpose of empowerment. It further refines the early goal model as illustrated in Figure 1 with more precise role and goals. We propose the 'training the trainer' programme as an approach in empowering the community. In the program, the training is conducted for the community, by the community. The program has trained the trainers who are from the community. Then the trainers are able to continue to deliver the training skills to the community. In general, the training model has five main phases. They are training preparation, pre-training, training, post training and sustain the training. We can further elaborate the process model for training the trainer in the following subsections. To achieve the goal of training the trainer, some of the subgoals involve are 'prepare training', 'pre-training', 'training' and 'post-training'. A particular quality goal that must be achieved is 'sustain the training'. Sustainability is the ultimate goal for ICT4D. The community project needs to be sustained by the community. During the initially funded phase from the government or a corporate agency, the community needs are learnt and decisions on how to sustain the project for the benefit of the community are determined. In our context, four important roles are needed in

achieving the goal to train the trainers. The people need to play the role as Trainer, instructor/ISITI IT Group, trainee, TelecenterManager in this programme. Due to the space limited, we only present the goal model for pre-training as shown in Figure 3.

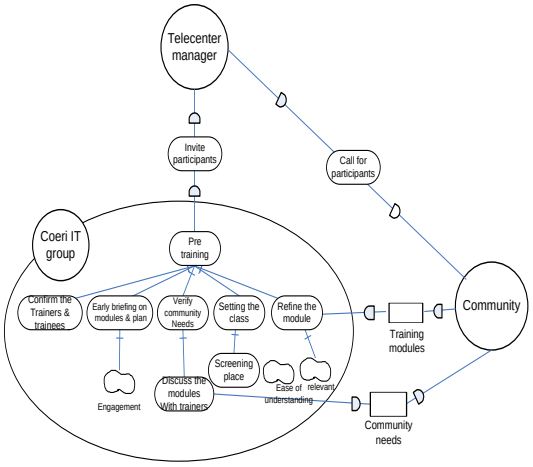

Figure 3: Goal model for 'pre-training'based on i * framework

Pre-training has the goal to understand the community better. The community in this context is the people that act as the trainers and trainees for the IT training. It is important that rapport is built among them so that they can express to us their problems and provide feedback from the training. This phase is like an ice-breaking session. It enables us to know the trainers better by chatting with them; are aware of their literacy level, understand their life and at the same time appreciate their commitment to become trainers in their community. During the discussion, we get to know their needs, their community needs of ICT upon achieving the goal as shown in Figure 4. Then we can position ourselves to serve them better. For example, after the pre-training phase, we will refine the module to cater for the literacy level of the trainer; we will improve the training style to make it informal due to the reduction of participants as trainers. Three parties are involved in achieving the goal of 'pre-training'. The IT group relies on the Telecenter manager for inviting the participants for the training. To accomplish this goal, the telecentre manager relies on the community to achieve the goal of 'call for participants'. The community relies on the IT group for training modules. The IT group members are required to work on the goals of 'confirm the trainers and trainees', 'brief the modules and training plan', 'verify community needs', which relies on the community, 'setting the class' and 'refine the module'. The refinement is needed towards achieving the quality goals of 'ease of understanding and relevant'. In other words, the refinement is necessary to ensure that the modules are understandable and relevant to the community.

Viewpoint system mapping

We can model the technological aspect of ICT4D through scenario model. The aim of this step is to produce a low-level plan that can be executed by people. The scenario model presents the sequence of the training program and inter-relationship between the program. The scenario model presented here is playing the similar function of the activity diagram in conventional project management. In a scenario model, the activities are designed to serve a particular goal. The plan is initiated by a person or members in an organisation and there is a trigger point or community needs on having this plan. The community needs element is the output of the needs analysis. It shows the needs of a particular community. They are six columns to further describe a plan in the scenario model. The scenario model can model the condition in which an activity is valid. It shows the precondition in working on a particular activity.

3. Evaluation and Conclusion

To evaluate the proposed method, we conduct a qualitative and heuristic study as reported in this section. An interview with the project manager in ISITI on the usability of agent models is conducted. In sum, the model is effective and at the same time provides flexibility to accommodate the demands and needs of the community and the funders of the ICT4D projects. On the other hand, we conduct a heuristic study to compare the scenario model that is used to working on project plan with the activity diagram that is used for software project planning. According to Ian Sommerville[9], a project plan sets out the resources available to the project, the work breakdown and a schedule for carrying out the work. The scenario model is able to explicitly model activities, activities' dependencies, resources of activities such as human resources, time, budget and hardware; people responsible on activities.

We introduce new artifacts for ethnography study. The artifact mentioned is known as agent models. It is able to prescribe the potential usage of ICT4D explicitly through the usage of agent models. On the other hand, the models presented in the paper can provide a cross cut on introducing any ICT applications to the community. In fact, the models are able to describe the potential ICT usage in Bario community. From the case study given, it shows the value of agent models in engineering the requirement for ICT4D. In future, we would like to model the potential usage of ICT in other sites like Long Lamai, Lalapan, Bekalalan. In addition, we would like to continue to model the design of the IT system based on those models given. A fruitful results is showcase in our work to model eCommerce application through agent models[6]. In addition, we would like to conduct an empirical study for the usability of those models with social science. A validation of the agent models as a new form of contact between stakeholders is worth to explore empirically.

References

[1] CheeWyai, L., Cheah, W., Chowdhury, A. K., and Gulden, C. 2015. Engineering sustainable software: A case study from offline computer support collaborative annotation system. Proceedings of IEEE Malaysian Software Engineering Conference, 272-277.

[2] Sterling, L. and Taveter K. 2009. The Art of Agent Oriented Modelling, MIT Press, Cambridge.

[3] WaiShiang, C., Mit, E., and Halim, A.A. 2015. Shared Single Display Application: An interactive patterns approach. *Journal of Software Engineering and Its Applications.*

[4] WaiShiang, C., Sterling, L., and Taverter K. 2010. Task Knowledge Patterns reuse in multi-agent system development. Proceedings of 13th International Conference on on Principles and Practice of Multi-Agent Systems, Kolkata, India

[5] Wilmann, D. and Sterling, L. 2005. Guiding agent-oriented requirements elicitation: HOMER. Proceedings of Fifth International Conference on Quality Software, 419-424.

[6] Shiang, C. W., Halin, A. A., Lu, M., and CheeWhye, G. 2016. Long Lamai Community ICT4D E-Commerce System Modelling: An Agent Oriented Role-Based Approach. *The Electronic Journal of Information Systems in Developing Countries*, 75.

[7] Gordijn, J., Akkermans, H., and Van Vliet, J. 2001. Designing and evaluating e-business models. *IEEE intelligent Systems*, 16(4), 11-17.

[8] WaiShiang, C., YeeWai, S., Nizam, S., and CheeWyai, L. 2016. Agent oriented requirement engineering for lake mathematical modelling: Preliminary study. *Journal of Telecommunication, Electronic and Computer Engineering (JTEC)*, 8(2), 5-10.

[9] Sommerville, I., (2010), Software Engineering 9th ediion, Pearson.