Exploring sociotechnical gaps in an intercultural, multidisciplinary design project

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EXPLORING SOCIOTECHNICAL GAPS IN AN INTERCULTURAL MULTIDISCIPLINARY DESIGN PROJECT

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Abstract. This paper highlights the need for the creation of artefacts that make visible the gap between social requirements and the technical affordances of technology. Augmenting the visibility of this gap can lead to a better integration of the process and product of interaction design in intercultural and multidisciplinary projects. Sociotechnical matrices are presented as artefacts that can help to explore this gap. This is illustrated with a case study of the design of interactive systems for farmers in rural Kenya. We discuss experiences in the use of these matrices and new challenges that have emerged in using them

1. Introduction

This paper highlights the need for the creation of artefacts that make visible the gap between social requirements and the technical affordances of technology. This sociotechnical gap is defined not only as a problem of matching technology to local user requirements, but also as one of managing assumptions, knowledge and expectations across different disciplinary and cultural boundaries. In line with ideas from Ackerman (Ackerman, 2000), we argue that augmenting the visibility of this gap can lead to a better integration of the process and product of interaction design in intercultural and multidisciplinary projects.

In this paper we discuss the rationale behind the creation of artefacts to support the sociotechnical design of interactive systems for farmers in rural Kenya: the 'Village eScience for Life' (VeSeL) project[1].

2. Exploring the gaps with sociotechnical matrices

In a culturally and disciplinary diverse setting, it can be very challenging to capture effectively actors' assumptions, knowledge and expectations. Many techniques and frameworks offer different solutions for successful participation in design, e.g. exploratory design games (Brandt, 2006); multidisciplinary annotation and collaboration styles (Adamczyk & Twidale, 2007). These methodologies have the merit of viably

[1] For more details on VeSel visit http://www.lkl.ac.uk/projects/vesel/

exploring the problem domain. However, making visible and integrating actors' views for exploring sociotechnical gaps in the design process remains a challenge.

The VeSel team has addressed these gaps by designing artefacts for collaboration, to which we refer to as sociotechnical matrices (STM) – for more details on how these have been implemented see (Camara, Abdelnour-Nocera, & Dunckley, 2008). STM highlight the intercultural and multidisciplinary characters of the design process and support the different actors in evaluating the social and technical implications of the scenarios driving design. A sample excerpt showing the key structure of STM, but not all dimensions, can be seen in Table 1.

Table 1. Excerpt from Sociotechnical Matrix[2]

Dimension	**Attribute**	**Device or Activity**	**Issues/ Implications for users and context of use**	**Issues/ Implications for technology**
Fitness for purpose	Requirements	Improve knowledge of water resource management and water usage leading to improved agricultural practice, food security and income.	Why would they want this? Is there evidence for this?	Key technology needed to achieve this is…
Trustworthiness	Confidentiality (for all stakeholders)	Farming Knowledge management system	What aspects of the communities' life/practices should be kept confidential? Competitive advantage?	How to achieve this technologically?
Acceptability	Cultural fitness (issues about cultural resistance not addressed elsewhere)	Farming Knowledge management system	What are farmers' perceptions of VESEL solution? Are social hierarchies and values being clearly violated with current VESEL design?	How malleable is the technology?

In the following lines, we briefly illustrate and explain the rationale for creating STM as tools to deal with the challenges posed by interculturality and multidisciplinarity.

[2] A full STM can be seen in http://itcentre.tvu.ac.uk/~VeSeL/matrixsample

2.1. THE DESIGN SETTING AS INTERCULTURAL

Research on the consumption of technology has found evidence of the integration of artefacts into the everyday life of consumers in ways that differ from those intended by its producers (Honold, 2000; Miller & Slater, 2000). Supposed global products go through a creative process of use and interpretation that will differ to some extent with its built-in meanings and uses. This is a phenomenon highlighted by Suchman (Suchman, 2002) and other authors (e.g. Abdelnour-Nocera, Dunckley, & Sharp, 2007; Mackay & Gillespie, 1992) who see computers and systems as interpretatively flexible. Interactive systems are subject to interpretations grounded in the cultural spaces of their producers and users (Shen, Woolley, & Prior, 2006). STM expose these intercultural gaps by allowing the different actors to explicate their own interpretive frames and reflect on their own cultural positions.

In VeSeL, STM are accessed online by members of the team who can give their comments and represent their views, including those of users, about particular scenarios and associated prototypes. In this case, the structure of STM in VeSeL has been adapted from the work of Sommerville and Dewsbury (Sommerville & Dewsbury, 2007) who created matrices around dimensions of systems dependability. Our objective is to design systems that are dependable in supporting knowledge exchange and communication for farmers in sociotechnical configurations rural Kenya.

2.2. THE DESIGN SETTING AS MULTIDISCIPLINARY

The importance of a sociotechnical perspective for interaction design also lies in recognising the issues involved in translating knowledge from users into different types of technical knowledge. In this sense, the design setting is a sociotechnical system in which different 'boundary zones' can be found. Each of these zones is 'a transformation zone where representations [of users/actors and technology of the system] are negotiated and handed over between different professions. A boundary zone is also a way of addressing the multidisciplinary challenge' (Hansen, 2006).

STM have been used and iterated in VeSeL as artefacts to represent these zones and their evolution: field studies from farming communities have been fed into STM to inform the creation and evaluation of the first sociotechnical scenarios with technical input from users, interaction designers, educators, sensor network and software engineers; these scenarios in turn have been fed into a second iteration of STM to define an evaluate use cases as they are developed into prototypes, which will become the focus of a third round of STM and so on until post-deployment activities.

3. Have STM bridged the gap in VeSeL?

In VeSeL, the use of STM has been positive but it has also faced a number new of challenges. On the positive side, using STM has highlighted the different cultural positions of the members of team, which in turn has clarified which key metaphors and cultural practices should be recognised and included in the user interfaces for Kenya; matrices have exposed differences across the expectations of the different stakeholder groups in the project, e.g. engineers, users, designers, educators, agricultural experts, helping to overcome the multidisciplinary challenge. Without matching the sociocultural factors to the technological factors in one frame of understanding, the solutions would very likely have been abandoned as soon as we left the sites.

In terms of new challenges, we have not been able to reach an even level of participation in the use of STM for two reasons. Firstly, local users and champions have not had continuous direct access to the online STM due to technical problems and, more importantly, to difficulties in explaining the role of this artefact in the design process. The workaround for this has been to bring the 'voice' of the users into the STM by arranging the information users provide in field studies and other communications in relevant sections of the matrix. We acknowledge this is not ideal and is open to bias and misrepresentation. The VeSeL team is now finding new ways of expressing the role of the different concepts present in STM so users are able to provide information directly in them.

Secondly, it has been difficult for all partners to fully engage with the filling of STM online. So far we have found two main reasons for this: the need to further clarify why they are instrumental to the design process, e.g. while for the work of interaction designers the value of STM is immediate, engineers need further elabora-tion on how decisions made at implementation level have a direct impact on technology acceptance and perceived usefulness; the need to improve their usability, e.g. avoiding text heavy screens and facilitating the visual recognition of whether arguments are in support or against aspects of the scenarios or design decisions being proposed. At the time of writing, we are trying new versions of STM and strategies for their use in VeSeL.

While STM have not been used to record every single aspect of the sociotechnical gaps we face, they have helped the VeSeL team to be more aware of them. STM have 'augmented', in Ackerman's terms (2000), the nature of these gaps so we can deal with these more effectively.

References

Abdelnour-Nocera, J., Dunckley, L., & Sharp, H. (2007). An approach to the evaluation of usefulness as a social construct using technological frames. *International Journal of Human-Computer Interaction, 22*(1-2), 153–172.

Ackerman, M. (2000). The intellectual challenge of CSCW: the gap between social requirements and technical feasibility. *Hum.-Comput. Interact., 15*(2), 179-203.

Adamczyk, P. D., & Twidale, M. B. (2007). *Supporting multidisciplinary collaboration: requirements from novel HCI education*. Paper presented at the Proceedings of the SIGCHI conference on Human factors in computing systems.

Brandt, E. (2006). *Designing exploratory design games: a framework for participation in Participatory Design?* Paper presented at the Proceedings of the ninth conference on Participatory design: Expanding boundaries in design - Volume 1.

Camara, S., Abdelnour-Nocera, J., & Dunckley, L. (2008). *Exploring the Problem Domain: A Socio-Technical ICT Design for the Developing World*. Paper presented at the Proceedings of the tenth conference on Participatory design: Expanding boundaries in design.

Hansen, T. R. (2006). *Strings of experiments: looking at the design process as a set of socio-technical experiments*. Paper presented at the Proceedings of the ninth conference on Participatory design: Expanding boundaries in design - Volume 1.

Honold, P. (2000). Culture and Context: An empirical study for the development of a framework for the elicitation of cultural influence in product Usage. *International Journal of Human-Computer Interaction, 12*(3), 327-345.

Mackay, H., & Gillespie, G. (1992). Extending the social shaping of technology approach: ideology and appropriation. *Social Studies of Science, 22*(4), 685-716.

Miller, D., & Slater, D. (2000). *The Internet : an ethnographic approach*. Oxford ; New York: New York University Press.

Shen, S.-T., Woolley, M., & Prior, S. (2006). Towards culture-centred design. *Interacting with Computers, 18*(4), 820-852.

Sommerville, I., & Dewsbury, G. (2007). Dependable domestic systems design: A socio-technical approach. *Interacting with Computers, 19*(4), 438-456.

Suchman, L. (2002). Practice-based design of information systems: notes from the hyperdeveloped world. *The Information Society, 18*(2), 139-144.