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Bridge Builders in IT Artifact Development

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Abstract

This paper analyzes the role of 'bridge builders' in Information Technology (IT) artifact development, focusing on new, challenging information systems (IS) contexts, packaged software development and outsourcing. Both literature and empirical analyses on 'bridge builders' in IT artifact development are carried out. The literature review combines findings from several yet separate research communities. Based on the review, a categorization of what this 'bridge building' includes in IT artifact development, is outlined. The 'bridge builders' are expected to understand the users; represent the users both in presentational and political sense; and to facilitate collaboration in IT artifact development, in doing so serving either the interests of the operational or managerial stakeholders. Furthermore, by utilizing this categorization as a sensitizing device, two empirical cases are analyzed, showing that the 'bridge builders' are expected to and occasionally also succeed in understanding the users, representing them both in presentational and political sense, and facilitating collaboration, serving the interests of the operational or managerial stakeholders. Our empirical findings point out the varieties and challenges involved with this role in IT artifact development. We especially emphasize the importance of this position in the new, challenging IS contexts, and argue for further analyses of it.

Keywords: Bridge builders, IT Artifact Development, Collaborative Development, User Involvement, Representation, Empirical Interpretive Research

1 INTRODUCTION

This paper analyzes the role of 'bridge builders' in Information Technology (IT) artifact development. IT artifacts are 'bundles of material and cultural properties packaged in some socially recognizable form such as hardware and/or software' (Orlikowski & Iacano 2001, p. 121). It has been widely accepted that users should be taken into account while developing IT artifacts. Especially in information systems (IS) research user involvement has been a central topic for decades and currently even legitimately labeled an 'old, tired concept', which, however, needs revisiting (Markus & Mao 2004). Particularly Scandinavian trade unionist and recent participatory design (PD) traditions have emphasized the importance of active worker/user participation in IT artifact development (Greenbaum & Kyng 1991, Iivari & Hirschheim 1996). Also the field of Human Computer Interaction (HCI) has emphasized the importance of involving the users in approaches such as Usability Engineering (UE) and User-Centered Design (UCD) (Cooper & Bowers 1995, Kujala 2003). Due to the long background, also several reviews on user involvement have been produced; outlining the benefits and challenges of user involvement as well as pointing out gaps and inconsistencies in the existing research (see e.g. Cavaye 1995, Kujala 2003, Markus & Mao 2004). User involvement is argued to contribute to system success through creating buy-in, through improving the system quality and through improving the user-designer relationships (Markus & Mao 2004). Besides many practical problems related to user involvement in IT artifact development, it has also been argued that user involvement is a very vague concept and there is altogether confusion regarding what user involvement is and how it should be accomplished (Asaro 2000, Cavaye 1995, Kujala 2003).

In this paper the focus is on the role of bridge builders, who aim at bridging the gap between users and designers in IT artifact development, i.e. they aim to manage diversity and cooperation across different, but intersecting social worlds (of users and designers) (cf. Star & Griesemer 1989 on boundary objects). Therefore, this paper discusses user involvement of a particular type. Fine-grained analyses on this type of user involvement have recently been called for, particularly to address the new, challenging IS contexts, package installations and outsourcing as examples (Markus & Mao 2004). Some literature addressing the 'bridge builders' in the IT artifact development already exists. Different IS change agent roles have been identified (Markus & Benjamin 1996), usability/UCD/UE professionals have been positioned as bridge builders between designers and users (e.g. Borgholm & Madsen 1999, Clemmensen 2004) and the role of professional ethnographers in bridging work practice and system design has been discussed (e.g. Karasti 2001). However, even though the importance of these bridge builders has been acknowledged, more empirical research should be carried out. Empirical studies relying on participatory action research (cf. Lincoln & Guba 2000) have addressed 'bridging the gap' between users and designers (e.g. Bødker 1996, Greenbaum & Kyng 1991, Karasti 2001), but interpretive empirical inquiries only aiming at understanding - not interfering with – this role, are clearly lacking, and particularly this is the case in the challenging new IS contexts as described by Markus and Mao (2004). This paper starts to fill in this gap.

The paper is organized as follows. The next section reviews existing literature on 'bridge builders' in IT artifact development as a theoretical basis for our empirical analysis. The third section discusses the research method utilized in our empirical analyses and the results of the empirical examination. The final section summarizes the results, discusses their implications and outlines paths for future work.

2 BRIDGE BUILDERS IN IT ARTIFACT DEVELOPMENT

In this section literature addressing bridge builders in IT artifact development is critically examined. First, some assumptions relating to the background these bridge builders are to have, are discussed. One area of expertise originates in IS and IT design professions, and the new 'bridge builder' role is only an addition to their expertise. Mambrey's et al. (1998) argue for user advocates, who are to have

background in computer science, but who are expected to gain knowledge about users by working actively in user services and training. Others, in turn, are interested in how different types of change agents (Markus & Benjamin 1996, Markus & Mao 2004) - not only facilitate and manage, but also even manipulate collaborative development process. Then, the origin is in organizational development (OD), innovation, management or change politics literatures (Markus & Benjamin 1996). Furthermore, the bridge builders may have educational or occupational background in participatory democracy (Scandinavian or UK) or UCD approaches (Markus & Mao 2004), in human resources (HR) management and OD (Markus & Mao 2004), and in work oriented design (Blomberg et al. 1996) and ethnographically informed design approaches (e.g. Karasti 2001). Researchers in PD, HCI and Computer Supported Cooperative Work (CSCW) fields having background or interdisciplinary interest in social sciences or anthropology rely on expertise from those sciences. In particular, ethnography has been applied in bridging work practice and system design (Blomberg et al. 1993, Hughes et al. 1994, Karasti 2001, Suchman & Trigg 1991).

2.1 Understanding users

Intended users own domain expertise. The 'bridge builders' are assumed to 'understand the user' in order to be able to 'bridge the gap' between design and use. According to the literature, this can be accomplished in varying ways, e.g. by carrying out field studies, ethnographic fieldwork, interviews, empirical user testing or by participating in user services. As mentioned, Mambrey et al. (1998) report on a project where user advocates were trained as computer scientists and it was believed that they can understand users' point of view through their experiences in user services. However, unlike Mambrey et al. (1998), many interdisciplinary researchers in CSCW and PD fields advocate specific methods, in particular ethnography, for understanding users (e.g. Blomberg et al. 1993, Hughes et al. 1994). Also in the field of HCI a strong in interest in field methods and ethnographic analyses of users, their work practices and their contexts of use has emerged during recent years (see HCI methodologies such as Beyer & Holtzblatt 1998, Cooper 1999, Rosson & Carroll 2002).

2.2 Representing users - in presentational sense

Related to 'understanding users', the bridge builders are typically expected also to communicate their understanding to the IT artifact development, which typically takes place by 'representing users' in presentational sense. Representing in this sense refers to the crafting of representations - i.e. socially constructed artifacts – that are 'interpretations in service of particular interests and purposes' (Suchman 1995: 58). The bridge builders are expected to 'craft representations of users', whose main, but probably not the only, purpose is to 'make users and their work [activities] visible to the development' (Suchman 1995: 58). Regarding the challenge of communicating the understanding to design, some example solutions are discussed next. Suchman and Trigg (1991) and Karasti (2001) have applied video-based interaction analysis to produce representations of users' activities to design participants. Video representations were based on participant observation, video recording and in-depth analysis of data. They were used in workshops, where participants were drawn from research, design, and user organizations (see also chapter 2.4). Viller and Sommerville (2000), in turn, have contributed to the problem of how to combine ethnographic data and modeling. They have developed an integrated approach to social and object–oriented analysis. Also in the field of HCI, representing users in the presentational sense is in an important position. The UCD/UE specialists are expected to 'craft representations of users', such as user profiles, personas, scenarios and work models (see e.g. Beyer & Holtzblatt 1998, Cooper 1999, Rosson & Carroll 2002), for making users work visible.

2.3 Representing users - in political sense

The term 'represent', furthermore, can also be used in political sense. Representing user in political sense implies that user influence is exerted through intermediaries (Mumford 1983). Representing,

then, denotes ‘one person standing for another’ having delegated authority usually resulting from election (Merriam Webster online dictionary http://www.m-w.com). It refers to carrying the voice of a constituency into relevant venues of decision-making (Suchman 1995: 60). In ‘representative user involvement’ – i.e., there is a representative group standing for a user population – (preferably elected) user representatives are involved in the design process and are assigned some decision-making power (Mumford 1983). Bridge builders analyzed in this paper may also be positioned as this type of ‘user advocates’ ‘standing for the user population’ in the IT artifact development.

The traditional form of ‘representing users in political sense’ is a situation, in which elected or selected users act as user advocates. Relating to the selection of ‘representative’ users, Markus and Mao (2004) argue for seeing distinctions between different actors; participants and stakeholders, and various types of both of them. They claim that "developers select participants informally and favor higher-ranking participants over those who understand the work better" (p. 528). Stakeholders are those who are likely to be affected by a solution. Participants, in turn, “are the subsets of stakeholders who are actually given the chance to participate in solution development and/ or implementation activities” (p. 528). Solution refers to a package of IT plus complementary changes (p. 526).

Mambrey et al. (1998), in turn, have introduced different kinds of ‘user advocates’ to represent the users in political sense. The idea in their design project was that each project member retains competence in their own profession, i.e. the users should remain specialists in their work, and the designers in system (p. 296). It was the sole responsibility of the user advocates to ‘bridge the gap’. Furthermore, Cooper and Bowers (1995) show how the whole field of HCI legitimizes its existence through advocating ‘representing the user’ in political sense. They (1995, p. 48, 51) show that a ‘compassionate rhetoric’ or even a ‘political–war discourse’ has been used: HCI is postulated as necessary, since it represents or even ‘fights for’ the users, who are an ignored group in systems design and computer science. Finally, Karasti (2001) has analyzed research on the ways in which ethnography could inform design. Some studies relied on disciplinary division of labor with no user participation. Professional ethnographers were assumed to take care of ‘bridging the gap’ between work and design (ibid.). One could say that also they were expected to represent the user in the political sense in the design context. Ethics of ethnography assumes that ethnographers always stand on the side of the people they study. Therefore there should not be - at least in theory – a risk that trained ethnographers represent managers’ - or their own - interests and concerns over the indented hands-on users.

2.4 Facilitating collaboration – serving the interests of operational stakeholders

The bridge builders can also be positioned as facilitators of collaboration between users and designers. Finken (2003) has analyzed PD tradition and shows that it constitutes IT artifact development, users and (research) designers in a specific way that is divergent from other traditions. The tradition constructs itself as empowering and other traditions (functional, socio-technical) as hegemonizing – serving the needs of the management. The PD tradition postulates organizations and IT artifact development as conflict laden, and research designers on the side of the oppressed. They should act as advocates of democracy. Design, on the other hand, is postulated as cooperative work that necessitates mutual reciprocal learning. Users and designers are positioned as experts whose cooperation as equal partners is expected. (Finken 2003.) Therefore, the research designers can also be seen as being positioned as ‘bridge builders’, bridging the gap between ‘hegemonizing designers’ and ‘users’.

Altogether, in PD literature a multitude of methods and techniques has been recommended for facilitating collaboration between designers and users (to be used by the research designers or by the ‘hegemonizing’ designers themselves). Facilitating collaborative meetings has been done, for example, by using video as a medium for reflection and design (see Suchman & Trigg 1991, Karasti 2001). Video representations have been co-viewed in collaborative workshops, where participants were drawn from research, design, and user organizations (Karasti 2001). Also Hughes, King, Rodden and Andersen (1994) identify a number of ways in which they have used ethnography to inform design

and to facilitate collaboration; concurrent ethnography, quick and dirty ethnography, evaluative ethnography and re-examination of previous studies.

Also related to the field of HCI, some researchers have argued for more cooperation between users and designers, and maintain that UCD/UE specialists need to facilitate cooperation between users and designers. Recent HCI textbooks (e.g. Beyer & Holtzblatt 1998, Rosson & Carroll 2002) refer directly to PD literature and suggest more participative design. On the other hand, in the HCI literature the designers have also been postulated as a critical target group, who should perceive UCD/UE specialists as team members and allies (e.g. Cooper 1999, Rosson & Carroll 2002). Therefore, in this literature the facilitating 'bridge builder' is expected to 'serve two masters': to encourage the users to participate, but also to position him/herself as designers' team member and ally.

Markus and Mao (2004), in turn, argue for change agents in IT artifact development. "Change agents are people who play important roles in designing and executing participation opportunities for stakeholders. They might decide who gets to participate, how they will participate (via interviews, JAD sessions, or on teams) and what participation techniques (e.g. modelling methods) are used. Change agents might also lead teams of participants or facilitate their discussion." (p. 529) They note that traditionally IS professional were assumed to be these change agents, but nowadays several actors may play this role. Depending on the situation, the role of change agent might be filled by employees (managers, IS professionals or HR professionals). Alternatively, "managerial stakeholders may employ external consultants and vendors to take over these roles from in-house personnel" (ibid., p. 529). In addition, professional change managers from human resource management and organizational development functions may be involved in large projects (ibid.).

However, important is to notice that there is a potential for conflicts between participants' interests or situations (cf. Markus & Mao 2004). Some types of bridge builders' motivation may be to fulfill particularly operational workers' needs (e.g. PD research designers, ethnographers) - especially bridge builders' influenced by critical tradition emphasizing conflict between capital and labor - but other types of bridge builders may aim to represent the managers' (or their own) interests and concerns over the indented hands-on users (cf. Markus & Mao 2004). Regarding the change agent models outlined by Markus and Benjamin (1996), especially the advocate model seems to advocate the managers' interests to achieve changes, not the 'workers'/users'. This issue will be discussed next.

2.5 Facilitating collaboration – serving the interests of managerial stakeholders

In their discussion on change agentry, Markus and Benjamin (1996) highlight organizational change management skills. They claim that IS specialists need to become better agents of organizational change to improve their organizational credibility. They are motivated by the views that new IT necessitates organizational change, and that organizations are increasingly outsourcing application development, computer operations, and even IS management (p. 385-6). They introduce three change agent models: traditional IS model, facilitator model and advocacy model. The facilitators are experts particularly in group dynamics and in facilitating group and organizational processes, and their task is to build users' capacity for change and increase clients' awareness of the need for change. The change advocates, in turn, "work to influence people's behaviour in particular directions that agents view as desirable, whether or not change "targets" themselves hold similar views" (p. 397). The latter model includes tactics such as communication, persuasion, shock and manipulation (p. 388). We argue that the facilitator and advocacy models represent mostly business needs for change instead those of the workers'. In all, in these change agent models user emancipation is not expected, and there is no evidence that the hands-on users are assumed to inform or influence decisions regarding changes in their organization. This type of bridge builders are 'advocates of the managers/change', instead of 'advocates of the user'.

3 EMPIRICAL EXPLORATIONS

In our empirical explorations on the role of bridge builders in IT development, we have relied on interpretive, qualitative research approach. The authors of this paper have empirically analyzed bridge builders in two specific IT contexts. The first case concerns a contract based IT development project that is labeled 'Collaborative Requirements Specification Project' in this paper. The latter case, on the other hand, concentrates on a packaged software (SW) development unit that is referred to as 'Manager Development Unit' in the paper. Regarding research approach, in the first case long-term ethnographic field study was carried out, while in the latter case the research approach is characterized as an interpretive case study. More detailed descriptions of each case are offered separately below.

3.1 Bridge Builders in Collaborative Requirements Specification Project

This case is about an intensive ethnographic (see e.g. Blomberg et al. 1993) field study on collaborative requirements specification project, where participants came from a client and a vendor organization, and from different occupations. One author of this paper and her fieldwork partner were involved in the specification work in the vendor side, and in collaborative requirements specification meetings in the client side. The project lasted for six months. The research data was obtained from the author's participant observations, experiences, field notes, interviews, informal discussions with some of the participants, and numerous documentary sources. In addition, 12 full day meetings were video-recorded. In the data analysis, e.g. interaction analysis method (Jordan & Henderson 1994) was applied. The study on the project was part of a two years long longitudinal field study on collaborative IS development between the vendor and the client.

The client is one office in a locally operating organization, which developed its information management by changing their old IT system for a new system provided by the external software (SW) vendor. The vendor is a qualified SW company, located five hundred kilometres away from the client. One aim of the development was to digitalize paper work in the office. From the client, almost all workers, i.e. stakeholders or intended hands-on users (Markus & Mao 2004), were expected to participate in the project: a secretary, an office manager, one chief inspector, and two inspectors. Also IS specialists of the client - a system manager and two project managers - participated in many specification meetings. From the vendor, three SW designers participated in the project. In addition, two ethnographers participated in the project as SW designers and participant observers. The chief inspector from the client was the manager of the project, and '*responsible to make sure that all relevant participants were invited, and to carry out administrative aspects, coordination, evaluation of contradictory specifications, and the description of use settings'*. The designers from the vendor, in turn, '*were responsible for preparing the topics of the specification sessions, for carrying out and directing them, for documenting the outcomes of the project, for maintaining the documents and their versions, and for planning, carrying out and directing the testing phase of the project*' (Project plan).

3.1.1 Understanding user

The designers from the vendor were not willing to get closer to users. They viewed collaborative specification sessions as places for gathering SW requirements - not for analysing users' actual work. Designers did not mention explicitly that they did not want to understand users, but they told to the ethnographers that they would have wanted to collaborate with the IS specialists and the office manager instead of the users. They explained that it is presumable that users do not understand specifications, and are not able to tell and decide requirements. In all, the only situation, when the users' actual work was near to be seen by the designers, was at the beginning of the project, when copies of secretary's work documents, forms etc. were presented. The secretary tried to make her work practices visible to the participants. She twice fetched a big stack of real work documents that she had put into folders. She explained to the participants her ways of organizing and filing the documents, and

how she used particular colours for coding them. However, it remained unclear to the designers what knowledge she needed for doing her work tasks, and how tasks related to her co-workers' tasks. The secretary repeatedly invited others to her workspace to see how she did her job. Nobody responded to the invitations, and the participants settled for copies of the secretary's document examples.

Like mentioned in the project plan statements above, the chief inspector from the client was responsible for the description of use setting. The project plan did not include any methods for analysing users' work. It was expected that user participation itself brings along users' view on requirements. Furthermore, it was implicitly assumed that co-workers, managers and in-house IS professionals self-evidently understand the work of each others. However, in many situations they could not do that. In particular, the secretarial support work was not made visible. Suchman (1995) emphasizes that "the way people work is not always apparent. Too often, assumptions are made as how tasks are performed rather than unearthing the underlying work practices" (p. 56). She continues that "in the case of many forms of service work, we recognize that the better the work is done, the less visible it is to those who benefit from it" (p. 58). However, the system manager hoped that the participants would have analysed users' work as a starting point of development. She told to the ethnographer (one author of the paper) that she had recently been involved in a course concerning work ergonomics, and, therefore, she wanted to take the secretary's work into consideration. She intervened in the project. Her intervention will be discussed in the subsequent chapter.

3.1.2 Representing user – in presentational sense

SW designers did not produce representations of users' actual work. All they produced were envisioned use cases and user interface (UI) models. The system manager let the participants know that she was worried about the lack of understanding of current work and its problems. Because of her and designers' conflicting expectations of representations (see chapter above), she organized a session for analysing users' work. She had prepared a tentative representation of work process into the wall of the negotiation room by applying a wall chart technique. The secretary and the office manager had joined later in refining it. In the session, after presentation, discussion and completion of the representation of current work, the workers wrote up and store the representation. After that, the picture was re-constructed to represent future work process. Designers did not participate in the discussion, and did not document it. The only documentation they made was limited to photographs of the wall charts. Despite their insufficient knowledge on users' actual work, however, the designers drew a picture of work processes into digital form, and envisioned solutions, e.g. use cases and UI models, to be evaluated in the subsequent sessions.

3.1.3 Representing user – in political sense

Especially the system manager acted as a 'user advocate' in the project. She organized the wall chart session and invited the secretary to the front of the wall picture, in order to support the secretary to explain her tasks with the help of the wall picture. The office manager, in turn, advocated inspectors and himself in the front of the picture. He presented and highlighted their work, and explained why work documents should be available in electronic form for them. He was also informed about the secretary's tasks, and could have described them to designers. However, he represented mostly organizational and management point of view of work and the goals of its development. Furthermore, the office manager had organizational power over the other stakeholders, and his views were considered as decisions by the designers.

3.1.4 Facilitating Collaboration

During the project, both the designers from the vendor, and the managerial participants and the IS specialists from the client, were planned to take responsibility of the collaborative specification sessions, i.e. to act as change agents who may "lead teams of participants or facilitate their discussion"

(Markus & Mao 2004, p. 529). However, designers were not willing to adopt the role of bridge builder. The only way they acted as bridge builders was in planning agendas for the sessions and in producing formal specifications to be discussed by the participants. They did not want to be chairmen; one designer mentioned to the ethnographers "*it is not correct to command the customer*".

Methods, tools and documents of the project supported mainly designers' work in modelling and formalizing specifications. Because of the lack of collaborative methods and the distance between users and designers, figuring out design solutions in the context of users' actual work was difficult to them throughout the project. In these situations the system manager, the project manager and sometimes the office manager from the client acted unsystematically as bridge builders trying to translate (Williams & Begg 1993) between users' work situations and designed use.

3.2 Bridge Builders in Manager Development Unit

This case concerns a UI SW development unit of a large global corporation developing business-to-business IT solutions for international markets. There are approximately 30 employees in the unit. Most of them are SW designers, whose responsibilities include designing, coding and testing the UI SW they label the '*manager'*. The designers work in large-scale IT development projects including personnel from several organizational units. There is also a team of usability specialists including four persons in the unit. Access to the unit was gained through a research project in which the aim was to improve the position of usability activities in SW development organizations. The research project lasted for three years. The research data was obtained especially from individual and groups interviews, but also from questionnaires, field notes, company's documentation, email correspondence and memos from meetings. During analysis phase, the focus was on construction and co-construction of meanings related to the usability specialists and their work. One author of this paper acted as a researcher in the project, having a position of a 'sympathetic but authoritative interpreter' (Lincoln & Guba 2000) without any personal stake in the outcomes of the research project.

3.2.1 Understanding user

The usability specialists have empirically analysed users in many different ways in this unit. They have carried out field studies during which they have observed and interviewed the users, and organized empirical user testing and paper prototyping sessions, in which representative users have been invited to carry out typical tasks by using a paper prototype or an existing, functional '*manager'*.

3.2.2 Representing user – in presentational sense

The task of 'representing the users' in presentational sense is also in an important position in this unit. The usability specialists have utilized many strategies in 'making users and their work visible to the development'. Based on their field study data, they have produced a Context of Use (CoU) description – a document describing the characteristics of users, their tasks and the environment in which the 'manager' is used. In addition, they have videotaped the field studies and the tapes are available to the designers. Furthermore, they have created a persona (Cooper 1999) called *Eric* - a hypothetical user with specified skills and knowledge - to make users more visible to the designers. They have also presented the material at team meetings to 'make users (and *Erics*) visible'.

However, this has proven to be challenging. *Eric* was defined as naïve user with limited skills and knowledge. The designers have criticized *Eric* as '*too stupid*' (Usability specialist) and dismissed him as '*a special case, which we don't need to serve*' (Usability specialist). Furthermore, the documents and videotapes the usability specialists have produced tend to be ignored by the designers: *"The video material, you would have to go to the Mary's (a usability specialist) room to watch it, you can't watch it wherever. And those reports (CoU), I think nobody reads them. They are somewhere in the network drive but nobody reads them.*" (Designer) In addition, *"Anyway you have to read a lot of documents*

when you design SW. You have to read specification after specification. And you write a lot. In this situation you don't suddenly think that I could read more, there could be additional interesting documents that I could read. If it is not totally necessary, you just don't read them." (Designer)

3.2.3 Representing user – in political sense

The role of the usability specialists as 'user advocates', 'representing the user' in political sense, is also observable in this unit, "*Yes, we all know that we need to ask for comments from the usability specialists in the design phase.*" (Designer) "*The usability specialists check out whether the design is good*" (Designer) However, "*Sometimes we ask something, like how should we design this and that, but that's all.*" (Designer). The usability specialists cannot affect the design much, since it is up to the designers to ask for comments. The usability specialists complain that they do not have much decision-making power regarding the design solution: "*At this moment we can't trust that the projects know at what time they should contact us. We must follow the situation and control it and push ourselves into the projects. (…) If a project is in the early phase, it seems like they actually reject our involvement. They say you don't have to peep in here yet, we are doing nothing yet.*" (Usability specialist) "*And a software designer doesn't ask anything before he/she has coded everything and commented and documented it all. Then they can show it on screen and ask is this ok?*" (Manager). However, the responsibility of usability is assigned to the usability specialists alone: "*People think that because we have usability specialists, then they are the ones that do everything"* (Manager).

3.2.4 Facilitating Collaboration

In this unit it is also acknowledged that it is not enough that the usability specialists 'represent the users'. The designers should as well also be in contact with the users. Therefore, some designers have participated in the usability testing, paper prototyping and customer visit sessions. Furthermore, the usability specialists have been involved in the development of a new SW process model in which user involvement is included. According to the process model, CoU should be specified, usability requirements defined, and formal usability testing carried out in every project (Project documentation). The personnel also trust the process model to incorporate these activities into the projects: "*it should tackle the hurry phase of the projects. These things are done before the hurry phase. (…) When it's known from the beginning what is to be done, it's done at a much earlier phase and it's done well.*" (Manager) "*Now, when the new process is being implemented, now these [activities] are planned, and then you have permission to do them and time to do them, they are included in the schedules.*" (Team leader) Finally, in this unit the collaboration is focused only on the hands-on users. The unit being a part of a large, global corporation, the personnel does not consider or aim at serving the interests of managerial stakeholders, neither in their own nor in the prospective clients' organizations. They realize they are not allowed or capable to affect decisions at that level.

4 DISCUSSION AND CONCLUSIONS

In this paper we have analyzed the role of 'bridge builders' in IT artifact development. Particularly we have focused on 'bridge builders' in the new, challenging IS contexts, related to which fine-grained empirical analyses have been called for (Markus & Mao 2004). Especially the challenges and the variety associated with this role in different IS contexts has been addressed in this paper. Both literature and empirical analyses regarding this role in IT artifact development were carried out. Based on our literature review, a categorization outlining what this 'bridge building' may include in IT artifact development, was outlined. We argued that the 'bridge builders' are expected to understand the users; represent the users both in presentational and political sense; and to facilitate collaboration in IT artifact development, serving either the interests of the operational or the managerial stakeholders. Furthermore, by utilizing this categorization as a sensitizing device, we analyzed two empirical cases, showing that the 'bridge builders' in IT artifact development are expected to and

occasionally also succeed in understanding the users, representing them both in presentational and political sense, and facilitating collaboration. Table 1 summarizes the findings of our empirical cases.

Bridge builders	Requirements Specification Project	Manager Development Unit
Understanding user	Mistakenly assumed that user participation brings along this understanding, clients' participants knew about co-workers' tasks, but they did not understand how the secretary actually gets her tasks done	Usability specialists carry out customer visits and empirical user testing
Representing user – presentational sense	Users' current and future tasks as Post-it notes in the wall chart	Personas, Context of Use descriptions, video tapes, reports
Representing user – political sense	Client's manager as 'user representative' and IS specialists as adhoc 'user representatives'	Usability specialists as hired 'user representatives'
Facilitating collaboration	Collaborative specification sessions, IS specialists and a manager as translators enabling collaboration between users and designers, but in the sessions largely the managerial stakeholders given a voice	Designers invited to customer visits and empirical user testing, SW process model with user involvement, the focus on operational stakeholders

Table 1. Bridge builders in IT artifact development.

Regarding the efforts related to understanding the users, in both cases interesting issues were revealed. In the requirements specification project an interesting issue is that even though some users were present in the meetings, the designers were not interested in gaining understanding of users' work practice, even though the users tried to invite them to do this. In addition, in this project it was simply assumed that some sort of 'user representatives' present in the meetings is enough, them understanding also the work of their co-workers. However, this proved to be mission impossible. In the packaged SW development unit, on the other hand, no users were present in the design sessions, but there was a group of usability specialists hired particularly to understand the users, and a lot of effort was put on empirical inquiries aiming at gaining a throughout understanding of users, their work practice and the context of use, even though the users were not very near or easily approachable.

Representing the users - both in presentational and political senses - was also observable in the cases. In the political sense, in the requirements specification project there were adhoc attempts to 'represent the users' carried out by the client's IS specialists. Therefore, in an outsourced IT artifact development, the personnel from the client - particularly the IS personnel – proved to be a critical resource in the effort of 'bridging the gap', even though their effort was not planned in the beginning. In the packaged SW development unit, furthermore, the usability specialists were perceived to be the 'user advocates' 'representing the users' in the development. Actually, the responsibility of 'usability' was assigned to the usability specialists alone, who, additionally, complained they cannot affect the design much; since they are only allowed to comment on the solutions already produced. Therefore, one could argue that it is not enough that there is a group responsible for 'bridging the gap', if this group is not allowed to have any decision making power (cf. Mumford 1983).

Regarding facilitating collaboration in IT artifact development, we highlighted the distinction between serving the interests of the operational versus managerial stakeholders. In the requirements specification project the overall goal of the project was to collaboratively define the requirements. However, there was no tools or techniques defined to support that. From the viewpoint of facilitating collaboration between users and designers to serve the interests of the hands-on users, the project was not very successful. In the wall chart session some sort of collaboration was initiated by the adhoc 'bridge builder' (i.e. by the client's IS specialist), but especially the secretary's work was ignored also during this session. The work of the inspectors was reviewed, but also this was carried out largely by their manager. In all, this situation can be criticized as managerial authority over users work, and clearly it was the managerial interests that were served during the session. In the packaged SW development unit, on the other hand, the focus was only on the interests of hands-on users. The unit being a part of a large, global corporation, there were no opportunities or attempts to facilitate collaboration to serve the interests of the managerial stakeholders. Neither the usability specialists nor the designers were concerned or allowed to affect decision making at that level.

Regarding PD tradition (e.g. Greenbaum & Kyng 1991), our cases indicate a number of problems that can be associated with PD in industrial setting. In the requirements specification project, user participation was expected, but no PD methods or tools, nor research designers orchestrating the sessions, were available. The case indicates that there might be huge problems in implementing PD in the new, challenging IS contexts. Furthermore, regarding HCI literature and the literature arguing for ethnographers to 'understand users' and to deliver this understanding to the development, our cases highlight the already identified problem related to the cooperation with the designers. As mentioned, we emphasize that it is not enough that there is a group responsible for 'bridging the gap', if this group is not allowed to have any decision making power. Finally, Markus and Mao (2004) argued for change agents to design and execute participation opportunities. We identified these change agents from the cases, but we also argue that the vendors seem to be quite ill-equipped to take care of this matter. Especially in the first case, the vendor did not want and was not capable to take this responsibility, due to which the client's managers and IS specialists took it in adhoc manner in situ. Clearly, this in an issue to be addressed by the IS community while entering the new, challenging IS contexts.

In all, existing research has already discussed the role of bridge builders in IT artifact development. However, future research is needed particularly in the new, challenging IS contexts, in which there are clear difficulties in user involvement (Markus & Mao 2004). This paper contributes, first, by providing a fine-grained literature analysis related to this role, highlighting many important distinctions in the literature. Second, this paper contributes by proving insights of empirical, interpretive inquiries analyzing the complexities of this role in detail. Regarding our findings, we especially emphasize the challenges associated with this role and advocate critical analyses of it. This paper has several times touched upon political concerns and ethical issues connected to IT artifact development. Related to this, we argue that these 'bridge builders' (i.e. usability specialists, clients' IS personnel) should broaden their expertise repertoire to advocate the ethical concerns and to represent the voices of the marginalized groups in technological development. This is needed, since the users are never equally equipped to produce representations of themselves or to participate in the discourses on technological development (cf. Asaro 2000, Suchman 1995). Our empirical findings suggest that the SW designers were not particularly willing or capable to do that. We argue that these 'bridge builders' are desperately needed in these new IS contexts, but, however, there are many challenges inhibiting their work. Regarding paths for future work, utilizing constructs such as 'communities of practice', 'boundary objects' and 'boundary spanning' in the analysis of this role would be very interesting. Furthermore, 'representing users in presentational sense' was not discussed in depth in this paper. Therefore, more work is clearly needed related to the multitude of different kinds of representations - both of technology and of user - and related to their different kinds of uses and purposes. Finally, the bi-directional nature of 'bridge building' needs to be addressed in the future studies on the matter.

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