Technology as Catalyst and Context: Global Software Development through Postcolonial Third Spaces

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ABSTRACT
Transnational firms have become a standard form of organizing in the 21st century and their proliferation has aligned closely with advances in digital information technology (IT). IT can support tightly coupled work across multiple locations which is essential for the creation and sustenance of complex team structures required for accomplishing knowledge work – a defining feature of transnational firms and in particular of Global Software Development (GSD). In this paper, using a postcolonial lens, I document a much broader role for technology where it acts both as a catalyst for collaborative work and simultaneously as a context for collaboration. I argue that GSD coworkers create sociomaterial third spaces which act as a conduit for negotiation of power and are flexible and fluid enough to support constant renegotiations, a common characteristic of transnational situations. In keeping with postcolonial and multi-sited ethnographic traditions, I follow a project and a person across field sites to collect data for the case study presented here.

Author Keywords
GSD; Postcolonial perspectives;

ACM Classification Keywords
H.5.3 Group and Organization Interfaces, computer-supported cooperative work.

INTRODUCTION

An increasing number of firms now functional as transnational firms with distributed resources and expertise across the work. Global Software Development (GSD) is one such application domain and due to its inherent distribution across the globe is a fertile area for understanding issues of distributed work. In GSD, developers across locations are interdependent and often work in tightly coupled manner. Scholars in computer supported collaborative work (CSCW) have had a significant interest in technology-mediated work both within a physical setting and across physical locations (Harrison and Dourish, 1996; Olson & Olson, 2000). Foundational research in this area was driven by a technological determinist sensitivity that viewed technology as a medium for carrying information and the solution to problems encountered in working across distance, using this view, was to improve the carrying capacity of technology to make communication easier, better, and faster. The bulk of the theoretical motivation for this approach came from experimental social psychological studies that examined media effects and the constructs of 'media richness', 'bandwidth' and 'cues' and demonstrated that specific media are well suited for particular tasks (Daft and Lengel, 1986, 1984). This line of argument ran into trouble when it was seen that in practice counter examples are abundant. For instance, researchers found that social norms exist regardless of the use of technology that is supposed to mitigate or remove social cues (Weisband, 1994; Weisband, Schneider and Connolly, 1995). Studies also show that lean media is used commonly and has been quite successful at supporting communication across locations if integrated into work practices (Johri, 2011).

Recent literature has made it clear that distance matters because it hinders the development of social norms and practices around the use of technology (Hollan & Stornetta, 1992; Olson & Olson, 2000). In spite of the high prevalence of global work, workers commonly encounter extensive problems (Cummings & Kiesler, 2005; Gibson & Gibbs, 2006; Majchrzak, Rice, Malhotra, King, & Ba, 2000). Collaborative work is hindered by misattributions (Cramton, 2002), where workers in one location attributed a problem to workers in another location without examining the cause of the problem. This problem is exacerbated by lack of mutual knowledge and common ground among workers in different locations, leading to insensitivity of structures and processes in other locations (Cramton, 2001). One crucial issue faced by coworkers, alluded to earlier, is the formation of subgroups across locations. Subgroup formation is a result of coworkers aligning themselves with workers in their location as it is an easy reference group to identify with. This has implications for how work is negotiated and performed across locations with workers in different locations having or aspiring to more power than others. Not surprising, and well documented in the literature, power often resides with workers at the headquarters (Armstrong & Cole, 2002). This issue is critical to work dynamics in transnational firms.

Although prior accounts of technology-mediated geographically dispersed work have highlighted both technological and social factors, two elements are understudied. First, although prior work recognizes that

power resides, primarily due to current configuration of the global economy, in Western nations, research is not clear on how this shapes collaboration. Even with a changing global landscape even now most big firms – those more likely to be transnational – are headquartered in Western nations with power imbalances in their favor. This nation-centric aspect needs further research (Hinds, Liu & Lyon, 2011). Second, the role of technology in these transnational collaborations has not been explicated in terms of the material affordances of technology and its interaction with transnational social norms, particularly issues of power – does the use of technology in any way uniquely shape interaction and power dynamics in these settings?

POSTCOLONIAL PERSPECTIVES

Postcolonial discourse and transnational perspectives have gained significant visibility and acceptance within the HCI and CSCW community (Philip, Irani & Dourish, 2012; Irani et al. 2010; Lindtner et al., 2012; Muller, 2008) and among information systems scholars who examine ICT (Ravishnakar, Pan & Myers, 2012; Rydhagen, 2004). The emergence and growth of this topic is reflected in a series of workshops on "transnational HCI" held at various conferences such as CSCW, Ubicomp, and CHI in recent year (Vertesi, Lindtner, Shklovski, 2011; Shklovski, Lindtner, Vertesi, and Dourish, 2010). Irani et al. (2010) argue for a postcolonial sensibility to design and have proposed the term "postcolonial computing." In their view (Irani et al. 2010) postcolonial computing is "an alternative sensibility to the process of design and analysis" which derives its value by asserting "a series of questions and concerns by the conditions of postcoloniality but relevant to any design project (p.1311)." They further argue that even though colonial relationships do not exist in the same way as before, "global dynamics of power, wealth, economic strength, and political influence shape contemporary cultural encounters (p.1311)." According to Philip, Irani and Dourish (2012), postcolonial computing goes beyond critiques of postcolonial encounters and negative connotations of cultural difference to focus on the "productive possibilities" of differences. These differences, they write, are sites of creativity and possibility and "Attentiveness to the emergence of similar hybrid practices in information technology design can help render design more locally legible and contextually effective (p.8-9)."

Lindtner et al. (2012) integrate literature from transnational studies with research on 'appropriation' within CSCW to argue that appropriation can be seen as a cultural phenomenon and how it unfolds in relation to translocal processes. They present findings from an ethnographic research project conducted in China that examined collaborations and exchange among IT professionals in urban areas. Their findings expand CSCW's focus on socio-technical systems by arguing for a serious investigation of socio-political and socio-economic processes. They also present 'transnational imagination' as an analytical tool for future studies of cross-cultural and global issues.

My point of departure, from previous studies of technology-mediated distributed work, is to accept the power imbalance evident in the data. Furthermore, I begin by acknowledging that in spite of the barriers and boundaries transnational workers face, they are able to work collaboratively for long periods of time and form long term partnerships. My goal is to empirically understand how this contradiction resolves itself in practice. The empirical case study I present in this paper was also motivated by a desire to better understand transnational software development in its situated form (Suchman, 2007; Lave and Wenger, 1991) through an in-depth examination of work practices.

RESEARCH STUDY

This research study was designed as a multi-sited ethnography and the field site for this study was a research and development laboratory with offices in the U.S. and Japan. The firm conducted research and development in the area of hardware and software information and communication technologies with expertise in information management and media systems. The author spent a total of 5 months at the site and was at the U.S. site for 5-8 hours each day, except when he was collecting data at the Japanese site for 10 days. Although the time spent at the Japanese site was significantly less that then spent at the U.S. site, data about the Japanese site and informants was available in archival format and through primary data collection at the U.S. site. The overall data collected about the Japanese site and informants support in-depth interpretive analysis, consistent with an ethnographic study. Methods that allowed for an in-depth understanding of individual experiences were employed. Data were collected primarily through interviews and field observations and were supplemented by field surveys and archival materials available at the field site including documents, online databases, and digital audio and video data. Formal interviews were conducted with 36 individuals for a total of 56 interviews. For the purposes of this position paper I analyzed in depth the case of one U.S. based researcher – Jeff Williams – and his collaborative project, KnOrg – as he worked on developing software in collaboration with coworkers in Japan. *Therefore, although this is not a representative case per se of large-scale global software development, the nature of work is representative of and an exemplar of software development across distances.*

FINDINGS & DISCUSSION

Over a two year period Jeff developed a collaborative partnership with a team of researchers in the Japanese laboratory. The analysis revealed that this relationship could be partitioned in four broad areas starting with the beginning of the collaboration, a major collaborative initiative that involved the use of videoconferencing, the use of code sharing system for development, and finally, a stage of relative equilibrium in the collaboration. As Figure 1 shows, each of these events was viewed differently by Jeff and his collaborators - Kenji, Matsuo, Haruki, and Cho.

At each of these stage technology played a crucial role (last column in the figure) and different issues, from a postcolonial perspectives, came up during the collaboration. At each stage, how participants constructed a negotiated order becomes a useful way of understanding their work practices. The perfect example of this negotiation was the code repository and version control incident. In essence, the use of a code repository and version control was a way to change the work practice of software development across

the laboratories. Instead of the usual model of "throw the code," i.e. ship the code on a storage media to Japan, Jeff had deliberately decided to use a code repository and version control system to ensure that there was a reason for the teams to work together and that the coupling was evident across locations. This made both sides equally responsible for the software development. Initially the team in Japan resisted this, as it would have to work hard to make the system work across locations, but in the end they relented. In this case the power in the relationship was held by Jeff and not the team in Japan. This did not mean that serious negotiations were not done but at the end of the day Jeff's opinion held weight and he was able to pressure the Japan team into using the code repository and version control system. In Jeff's case, since the inception of the collaborative project negotiations with his Japanese colleagues were evident. The initial 'definition' of their collaborative project – in terms of what it will accomplish and who will work on what aspect of the project – was a critical step. Jeff recollected, and his recollection was supported by my interviews with the team members in Japan, that the initial stage was very fluid with frequent negotiations and sincere efforts on both sides to figure out the 'real' intent and expectations of the other person in relation to the project. Beneath the seemingly innocuous collaborative relationship, lay a strong power differential reflected in the negotiations. The findings from the case study show how transnational work is accomplished through postcolonial third spaces and how technology acts both as a catalyst and context for the creation of these work practices.

I appropriate Bhabha's (1994) metaphors of a "third space" and postcolonial studies to argue that transnational work is accomplished in and through the creation of "postcolonial third spaces" which are sites of situated working and represents a negotiated power order. Digital information technology provides the both occasion for power negotiations and also the substrate for work, acting both as a catalyst and context. Information technology provides the occasion for doing so by making workers engage with the issue of how to make technology "work" for them. Furthermore, in keeping with Soja's (1996) conception of a "thirdspace," these spaces are both real and imagined in that they involve material ways of working as well as conception and creation of social norms. In work terms, these spaces are essential for accomplishing transnational work in organizations that span international boundaries as they become the pathways where boundaries are negotiated, identities formed and imagined, and work enacted. Rather than an affordance perspective where technology is important for people to communicate, from this perspective it becomes an opportunity to communicate and have a dialogue thereby moving people towards common ground and mutual knowledge.

What role does technology play in postcolonial transnational work, specifically in the creation of 'third spaces'? Having looked at the affordance of third spaces for

	U.S. Developer	Japanese Developer	Postcolonial Issues	Role of Technology
Beginning	I was contacted to take my project; met the manager in Japan open house	My boss told me to work with Jeff; Our boss was told by the U.S. boss to work with Jeff	Headquarters-Periphery	Technology transfer as a catalyst for collaboration and context for negotiation of who will do what
Video conferencing	Status; showing face; not for real issues as language problems	Status but also teaching them how to communicate like Americans; preparation for talking	Mimicry Agency Ambivalence	VC as a context for communication but a catalyst for Kenji to train his team on U.S. communication methods
Code Share Repository and Version Control System	Important for technology transfer; if it goes to the other side we have no clue what is going on	Problematic to make it happen; resources needed; The need for it; The goal is Japanese translation only	Hybridity Resistance Appropriation	Catalyst for serious negotiations and for appropriation of the technology and therefore for learning; context for collaborative work as code shared and worked on together
Flexible Equilibrium	Working as a team and slowly giving control to Japan; Overall control to Japan and just little bit of support from the U.S.; ownership transferred	Customers in Japan and implementation of the project; Move to other projects that fit more with their expertise	Resistance (covert) Adaptability Assemblage	The project – KnOrg – as context of coordination and catalyst for many small things over time; technology both a mechanism for enactment of power differences and negotiation of status

Figure 1: Findings from the case study

addressing postcolonial concerns around issues of power, I now turn to examining the relationship between technology and social norms more closely. We can view the "third space" as a composite and shifting assemblage (Orlikowski and Scott 2008; Suchman, 2007). Technology in this instance was a catalyst for the team to negotiate and work together on solving a tough issue but was also the context in which the issue was resolved. The materiality is also evident in hardware needs and the need to purchase licenses and so on to make the overall system work. This created a new "thing" a new hybrid assemblage that now included a code repository and version control system, in addition to the materiality that existed before. It was also a new negotiated order were power relations were made to work and resulted in something novel as compared to what existed before. And, critically, it was a real as well as an imagined space thereby providing its inhabitants and infinite ways of expanding it to fulfill their purposes. Although my analysis, by prioritizing technology's role in transnational work, seems to be deterministic, in essence it is trying to illustrate technology's role within a specific situation. These spaces, as discussed above, are occasions as well as context for power negotiations. Constant negotiation does not imply equal power among participants or even the same value for other coworker's opinions. It worked out for the best but the initial resistance of Japanese team members was evident. In the new space that is catalyzed by technology, power relations are negotiated and renegotiated. This study, though, through its focus on transnational work and postcolonial perspectives emphasizes an oft overlooked aspect of how technology shapes practices – through its effect on power relations (Irani et al. 2010). Technology as a mediator of power relations is itself not a new notion but its role in catalyzing and providing a context for negotiations is a less studied aspect. Organizations and the technology they use often develop in an integrate fashion (Wulf & Rhode, 1995). This study raises questions about how technology designed to be repurposed can result in better practices as opposed to creating conditions that lead to breakdown in collaborative work – how can local improvisation take place (Suchman 2002).Therefore, it asks that designers and scholars of technology design reflect on questions such as: How do you design technology that allows people to repurpose it? How can emergent negotiated be supported? Can technology be designed with a positive outcome intended? For HCI researchers and designers, this has important implications as it raises a unique question – do we actually design for the technology to be appropriated and end-user modification so that they can negotiate and thereby construct and enact productive third spaces? Are the disadvantages of having a technology that does not serve the purpose at hand exactly overcome by the possibility it provides opportunities for negotiation? The findings also help reflect on the success of participatory design. By working with potential users researchers/designers actually create sociomaterial third spaces that lead to successful creation and enactment of "technology".

GSD and postcolonial discourse help us uncover and understand how technology becomes a catalyst for power discussion and negotiations to happen – how to use an implement a system, what will it require, how will it occur, who will be responsible for what – and also becomes the context as the that system itself becomes a player in the negotiation and also often, as in the case of videoconferencing, a mechanism for undertaking the very negotiations that would result in whether that technological solution will be used or not. These issues are of course not new or unique to transnational work. Power differentials have existed since global trade started and therefore it is conceivable that technology – particularly information technology – is not the only catalyst or context available to mitigate power differences and undertake collaborative work.

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