Interaction zones for remote workers: negotiating interlocking spaces

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Abstract
Current work into Interaction Space Theory addresses the needs of remote workers who spend prolonged periods away from their own organisation to conduct projects on behalf of their clients. Often based at the client's own office or project site, these remote workers can on occasion struggle to sustain visibility, identity with and a sense of belonging to their own organisation. Drawing upon empirical research conducted for the SANE project[1] this paper attempts to illustrate how individuals negotiate the physical, social and organisational boundaries that in turn form interlocking spaces between competing zones of interaction. It investigates how remote workers might utilise technological resources to reduce some of the existing constraints to human social interaction between participants at remote and co-located settings.

Keywords: groupware, multimodal systems, collaborative workplace technologies

1 Theoretical approach: negotiating physical, social and organisational boundaries

This paper takes as its source empirical work conducted for the European funded project SANE (Sustainable Accommodation for the New Economy), EU, F5 IST-2000-25257 and described in Foley, Rosenberg et al. (2003). I should like to present specific issues raised by informants in our empirical studies and to describe how these relate to current work in progress on the Interaction Space Approach. In essence, this approach addresses communication and collaboration in a real-life workplace, and takes into account the extra-linguistic context that includes shared resources and background information. The approach considers that to support natural interactions in the work context – remote workers or teams of workers develop a collective environment where they work together to solve problems. They bring together their procedures and concentrate on shared artefacts in the course of agreeing the sense of words or images presented there (Robinson, 1993). They thus create the common ground – "a sine qua non for everything we do with others… the sum of [the participants'] mutual, common or joint knowledge, beliefs, and suppositions" (Clark 1996, p 92). Indeed, common ground is regarded as fundamental to all co-ordination activities and to collaboration (Clark & Brennan 1991).

In particular, the Interaction Space approach considers the study of interaction in physical spaces and focuses on the ways people coordinate control and build common ground across their boundaries, that is, how they regulate access and preserve privacy. It also focuses on the

[1] EU Framework 5 IST project SANE (Sustainable Accommodation for the New Economy), IST 2000-25-257

presence of other people in their private, privileged and public zones and on the varying degrees of sharing, trust, and other aspects of social relationships (Rosenberg et al. 2003).

The approach aims to provide a framework wherein we can distinguish between the 'physical, social, and organisational' (Rosenberg 2004) freedoms and constraints imposed across different interaction zones. For some organisations the notion of a distributed workforce is neither new nor determined by the availability of technology. On the contrary existing work practices, structures, social networks and organisation cultures drive specific activities. In particular where there is a need to send individuals or teams to work at a client's location – sometime alongside not only the client's employees but also other sub-contractors. Whilst Information Communications Technologies facilitate, perpetuate even proliferate many of the activities associated with information exchange between the various stakeholders, it is not clear how such technologies can sustain, complement or develop the potential for interaction amongst individuals at a social or organisational level.

2 Empirical Studies: mobile workers at client sites

For example, it is apparent from our empirical studies that informants who work in 'agile teams' or as mobile knowledge workers, the issue of where they work, who they work with and for whom is paramount. In other words, a simple formulation of combining people, process and place is hampered by our lack of understanding into how people negotiate the physical, social and organisational boundaries between disparate working environments and cultures. Significantly, participants in the studies expressed a willingness to negotiate these boundaries. In particular, they raised specific issues relating to the dysfunctional effect of bringing together people from diverse working backgrounds into physical environments that could not support the organisational and social differences. For example, where an individual working at a client site is disorientated by the lack of contact they have with their own organisation despite the provision of technological resources such as email, phone, fax and access to fixed networks at the client site. Although not specifically raised by informants in this study, studies have shown that the willingness of participants to negotiate physical, social and organisational boundaries is also motivated by individual concerns over security of employment. For example, Whittle (2001), investigating the career dynamics of mobile workers, discovered many were anxious at the prospect of being overlooked for promotion. Indeed many in her study expressed the concern that after undue periods of time in the field they might eventually become invisible to their organization.

In the SANE project, adopting an ethnographic method, researchers conducted unstructured and semi-structured interviews with a small sample of project management teams in multi-client projects. Our objective was to establish the interrelationships between people, process, place and technology. Our key research questions addressed how these interrelationships influence communicative activity within agile teams of mobile knowledge workers. In particular, we sought to clarify whether augmenting the physical absence of others in virtual interactions spaces was dependent not only the technical efficacy of groupware systems to promote the exchange of information, but upon how collaborative technologies are able to provide users with a contextual awareness of others in terms of people, process, and place. Informants expressed the view that the provision of groupware systems alone are currently unable to fully support agile teams of mobile workers because they fail to provide a forum for informal interaction depriving them of the contextual awareness of others in their own organisation. For those workers who are required to spend prolonged periods away from their

own organisation, this has implications in terms of maintaining with their colleagues and employers a sense of trust, shared understanding and organisational identity.

The following example, describes an instance where collaborative technologies were unable to provide users with the necessary contextual awareness of others in terms of people, process, and place. Furthermore it details the coping and repair strategies individual workers at client sites adopted to maintain links to their own organization. It focuses on a specific discussion between two informants working within separate project teams where one interviewee relates the difficulties he encountered when he and his team were working away from the usual office environment at a client site for a prolonged period. He tells how in some respects technology was unable to assist them. For example, at an individual level, he told how he would periodically return to his home organisation simply to 'catch up on the gossip' and generally re-connect with his colleagues. He claimed that this was necessary simply to re-inforce his own understanding of who he worked for and at what activities and tasks. He acknowledged his commitment to and need to integrate within the client's team, but stressed that this did not necessitate him becoming part of their organisation. He was keen to promote the value of technologies that support remote, mobile working but did not believe they could replace face-to-face, co-located interaction. His colleague concurred, asserting that technology is an irrelevance when applied to sustaining human, social interaction. Despite the client providing his remote teams with their own desks, work areas, access to fixed networks, email and phone, individuals, he observed, continued to feel disconnected from their own organisation. Communicative activity between people was effectively sustained and augmented by the physical removal of individuals from remote to collocated locations and events where their visibility and mutual relations to their organisation could be verified and assured.

3 Conceptual framework: visibility and mutuality

This may indeed be a managerial rather than a technological problem but a failure to address where the physical, social, and organisational boundaries constrain interaction in co-located settings may cause us to overlook opportunities for resolutions in future mediated settings where potential breakdowns in trust, confidentiality and sense of permanency may be averted. In simple terms, for workplace designers the issue here is not just to design groupware systems that bring people together from remote locations to exchange information, but that can incorporate options to improve levels of visibility and mutuality amongst individuals within the context of their own organisation. At a theoretical level this would entail us developing a framework wherein we might understand the discrete measures of distance (or interactive zones) that can be opened up and closed down, traversed and restricted across physical, social and organisational boundaries. The intent in this paper is not to provide designers with a definitive template for new groupware systems, but to show how measuring the spatial and communicative dimensions of interaction spaces can provide conceptual insights into the possibilities and constraints for augmenting informal social interaction in virtual environments. The existence of such a framework I believe would be of value to researchers, workplace designers and users keen to provide or discover technological solutions which can address existing interactive challenges in remote and co-located settings.

3.1 Interactive zones

To illustrate the approach, in figure 1, we can distinguish between the zones by identifying the (same or different) places people inhabit in relation to the (same or different) processes in

which they need to collaborate. In addition, as well as positioning participants relative to their activities, we can also see that if participants wish to negotiate access to and acceptance within other zones they must observe each zone's discrete social and organisational protocols, rules and conventions. Successful negotiation of each zone occurs not within the zone itself but through the interlocking spaces to other zones. We measure this degree of negotiation by the spatial dimensions of interaction and visibility against the communicative scales of mutuality and reciprocity.

The 'notion' of interlocking spaces, and the terms mutuality and reciprocity are explored by Greenberg and Roseman (1998) who consider how social interaction in the workplace is constrained by, as they term it, the "gaps" that occur when people "move between different styles of work". Their approach to this problem was to develop a desktop based application, TeamWave, that adopted a "room metaphor" to compensate for these transitions. They describe 'mutuality', as "interactions within locales that maintain a sense of shared place" and 'reciprocity' as a feature of physical rooms where "collaborators know that others can see their actions and objects in the same way." (Greenberg and Roseman 1998: 1, 5, 21).

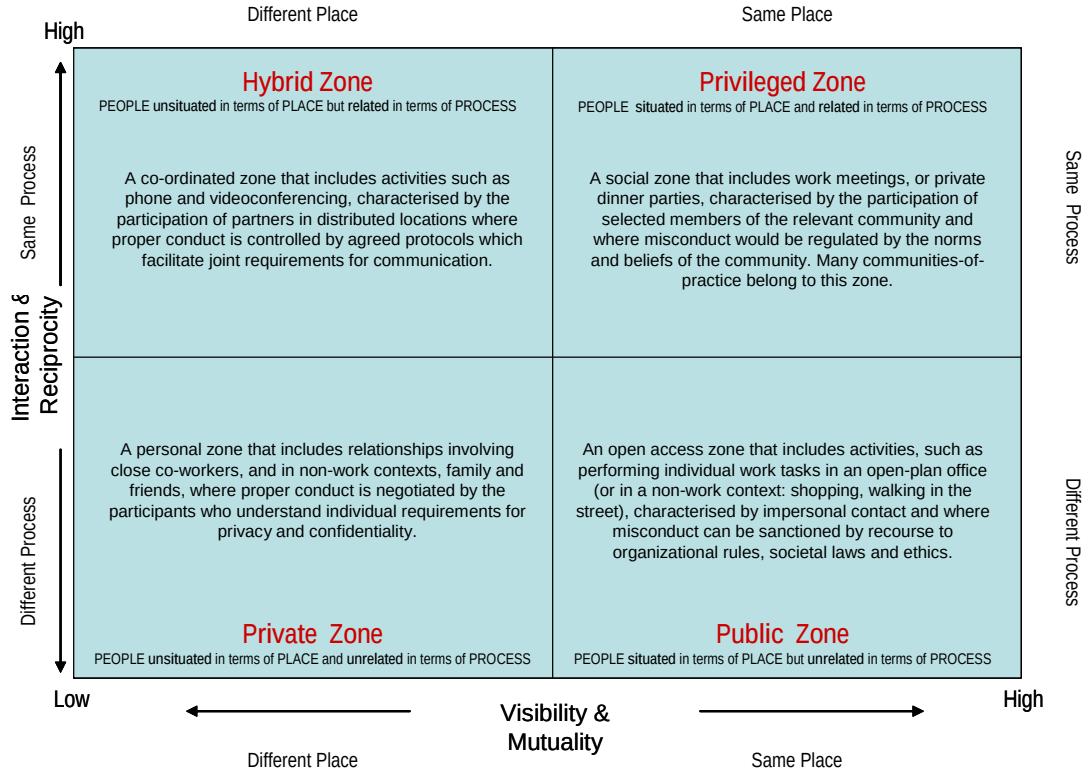

Figure 1 Interaction zones[2]

In the interaction zone model in Figure 1 we can see that Greenberg and Roseman's descriptions most aptly concur with the privileged zone – a social zone requiring 'a sense of shared place' and the facility for "collaborators to know that others can see their actions and objects in the same way." It is a zone that includes, for example, work meetings where people situated in terms of place and related in terms of process are regulated by the norms and

[2] Rosenberg, Foley et al. (2003)

beliefs of that community – in other words, the optimal zone for group collaboration. The private zone, by definition, reflects the converse of these requirements. The public zone requires 'a sense of shared place' but not the same facility for "collaborators to know that others can see their actions and objects in the same way." The hybrid zone, as it is represented in this model, I believe, is the most significant, because although it does not require 'a sense of shared place', if it is to harness the features of physical settings, it does necessitate the facility for "collaborators to know that others can see their actions and objects in the same way." It is this paradox the model attempts to convey.

3.2 Interlocking spaces

In figure 2 (below), we can see how participants who search for greater or less connectivity by moving (apparently) effortlessly from one zone to another must first negotiate the interlocking spaces (or "gaps") where the spatial and communicative boundaries between each zone establish the effectiveness of the communicative event.

Spatial			Zones		Communicative	
- Visible	- Interactive	←	PRIVATE	→	- Mutual	- Reciprocal
+ Visible	+ Interactive	←	PRIVILEGED	→	+ Mutual	+ Reciprocal
- Visible	+ Interactive	←	HYBRID	→	- Mutual	+ Reciprocal
+ Visible	- Interactive	←	PUBLIC	→	+ Mutual	- Reciprocal

Figure 2 Interlocking Spaces[3]

For our informants, their individual yet similar experiences of working at client sites suggest in each instance that their desire to collaborate with their colleagues was constrained by the very protocols that define and govern cooperation within the hybrid zone. As one informant makes clear, despite the client's provision of access to fixed networks, their own space, desks, connections to the daily network, the exchange of emails and phone contact with their own organisation, for mobile workers such resources can encourage not a proximity 'to' but a remoteness 'from' collaborative activity.

[3] Rosenberg, Foley et al. (2003)

Clearly it is not enough to sustain collaborative activities and a sense of belonging through simply raising the degree of interaction and reciprocity. Especially when the interlocking spaces that connect the hybrid to the other (privileged, public or private) zones of the workers' home organization appear to repel instead of draw the user into those areas that demand a lesser degree of interaction and reciprocity (private zone) or increased visibility and mutuality (public and privileged zones). This is because, as the above matrix shows, the spatial boundaries of the hybrid zone restrict visibility whilst promoting interaction (- Visible + Interactive) and its communicative boundaries constrain mutuality whilst promoting reciprocity (- Mutual + Reciprocal). It is a phenomenon that is aptly described by informants in this paper and I suggest can be represented as follows in the above models:

When the mobile workers wished to re-integrate themselves by directly accessing the public zone of their own organization from the hybrid zone it not only demanded an increased degree of visibility in spatial terms that current technological resources were unable to sustain in terms of technical sophistication and expense, but also a corresponding level of mutuality in communicative terms. The spatial and communicative deficiencies of the hybrid zone represented in the interlocking spaces as low visibility and low mutuality, show that it is not colleagues and resources at the home organization (residing in the public and privileged interaction zones) which are invisible to the mobile worker. On the contrary, it is the mobile worker (isolated in the hybrid zone), who can only redress the spatial and communicative deficiencies by utilising the increased degrees of interaction and corresponding levels of reciprocity offered by technologies which enable them to access people and resources through online connections. It is therefore the mobile worker who is invisible to colleagues and resources at the organization and it is this that is felt so keenly by informants.

3.3 Scenario

Any means of linking the hybrid zone to the interlocking spaces between the public and privileged zones must afford a requisite degree of visibility and mutuality to the user if it is to sustain the potential for prolonged interaction and reciprocity. This would alleviate the need then for strict and established protocols currently exploited by users in the hybrid zone and designed to compensate for the lack of visual cues. Besides Greenberg and Roseman (1998), others conducting research into applying visualization technologies to track group dynamics in groupware systems include Jancke et al. (2001), who build upon previous studies of "visual support for informal interaction focused on desktop systems" by Root, 1998; Dourish and Bly, 1992; Fish et al., 1992; Gaver et al., 1992; Tang and Rua, 1994. They demonstrate how advanced visualisation technologies, which draw upon increased multi-modal initiatives on the part of the user in terms of speech, eye and gesture recognition, can assist group dynamics by linking public spaces (e.g. kitchens) within the same building. My purpose in this paper is to build upon this research and provide a framework that can add further conceptual insight into how awareness of absent 'others' can be augmented in virtual interaction spaces. I believe the work not only of Greenberg and Roseman but also of Janke et al. especially their use of video walls in communal food areas is particularly apposite to the communicative and spatial issues raised in this paper.

For example, we can imagine a scenario whereby a remote, mobile worker at a client site phones her colleague at her desk in the open plan (public) office at their own organization. Normally, if they were co-located, they might either create a privileged space at the desk (within the public zone) or retreat to a corridor for an informal conversation. Given the constraints imposed by the lack of co-location, the two agree to meet in ten minutes in the 'interaction corridor' for an informal chat and 'catch up'. This corridor might be a room or

space set aside in the home organization wherein the remote colleague at the client site (using the videoconferencing facility on her mobile phone) and her colleague at the office can meet in an interlocking private or public/privileged zone of interactivity and reciprocity sharing greater visibility and mutuality. The room may simply be a kitchen or chill out area with the distinction of having a video wall affording improved visibility and ensuring greater spontaneity as it allows other colleagues (invited or simply passing by) to join the conversation.

Of course the remote worker's view of her colleagues is still restricted by the size of interface on their mobile. However, her colleagues are now able to see her and collaborate collectively. In other words, for the remote worker, interaction and reciprocity are sustained whilst her visibility and mutuality are increased by her colleague(s) moving into a public meeting area within the home organisation (an interlocking space between the privileged and public zone).

Referring once more to Figure 1, we can see that the remote worker has effectively been brought from a 'different' (hybrid) to the 'same' place of interaction as their colleagues. A semi public/privileged place characterised by its social facility to bring together people who at an organisational level are engaged in either 'same' or 'different' processes. By accessing the kitchen or 'corridor' that links the hybrid zone to the interlocking space between the public and privileged zones, the remote worker has the opportunity to re-connect with her own organization through speech and gesture as well as visual and auditory means thus increasing sensory bandwith and modality. I should add that although Jancke et al. (2001) noted a degree of willingness on the part of participants in their own studies "for some level of technological mediation" of this kind for "informal communication", the authors reported mixed responses to the acceptance of such provision. In particular, they also lamented the paucity of literature that left them unprepared for the levels of participant resistance to infringements of privacy in public space (e.g. incoming participants entering the zone turning off the visual and auditory components of the system so as not to be seen or overhead). The above scenario I describe is of course dependent on the willingness of participants to engage in informal interaction. It is for this reason I have attempted to present a conceptual framework which can address how participants negotiate differing social protocols that allow them to cross into other zones of interaction.

4 Conclusion

The purpose of constructing a typology of interaction zones is therefore to help workplace designers and researchers identify the interlocking spaces between the zones where virtual interaction can augment awareness of others in remote locations. It is also to draw attention to where potential infringement of zone boundaries might occur. In particular, the models illustrate that access to interaction in co-located settings is constrained by competing social and organisational protocols, rules and conventions. However, by increasing visibility and mutuality in proportion to interactivity and reciprocity, participants in a co-located event also augment the sensory bandwidth to encompass other modalities. Co-located work in a privileged space is often the preferred work setting for many, as it allows participants to set distinct protective boundaries that promote trust and shared understanding. However, the models suggest that where the privileged zone can be accessed by others inhabiting the public zone, participants should be able to negotiate a measure of interactivity where a sense of belonging can be sustained. This position is sustained by the informants' insistence that

current technological provision which allows mobile workers access to email, phone, fixed networks at their own organisation is unable to maintain and establish trust, shared understanding and a sense of organisational identity.

In conclusion, the theoretical approach demonstrates that the desire of remote workers to collaborate with their colleagues is restricted by the codes of behaviour that define and govern cooperation within the hybrid zone. However, the model suggests that where remote users operating in the hybrid zone can exploit access to the interlocking space between the privileged and public zones, they can be returned to a sense of belonging and identity within their own organisation.

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