

Fragmented Exchange: Disarticulation and the Need for Regionalized Communication Spaces

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Abstract:

This paper relates the discussion of articulation work (and of disarticulation) to issues of the creation and control of collective communication spaces. Four different types of settings are examined - occupationally segregated terrains, emergency situations, scarce-resource settings and performance-intensive settings. What is articulated in such settings is seen as depending on the properties of the communication spaces actors build, their zoning and contextuality; while instances of disarticulation within this space can be interpreted as a consequence of both regionalisation and/or a deterioration or even breakdown of envisioning and interrelating. CSCW design needs to take account of the regionalised character of "real world" communications by offering tools for creating a corresponding multiplicity of communication spaces.

1. Background

While CSCW derives from a commitment to establishing shared contexts, it is important to examine carefully and respect the control requirements of different groups of users along with the "politics" of sharing and withholding, inclusion and exclusion. The impulse to develop technical ways of removing barriers to communications derives from various sources ranging from quite personal desires to keep in touch with others to the corporate drive to exercise control over far-flung empires. But whatever the origins of these powerful forces, they all tend to

overlook the virtues of communicative forms that are not as fully open as the co-operative ideal would imply. The great variety of practices described in the growing collection of CSCW case studies points to the need to distinguish between interactions that aim at sharing, exposing, making explicit, or prying open, and those that seek to hide, create privileges, or maintain boundaries, but also to preserve privacy, autonomy, confidentiality and solitude.

A principal aim of this paper is to examine a variety of contexts with respect to actors' practices of articulation and "disarticulation". While articulation work is often a necessary but overlooked aspect of productive performance, we seek to show that its obverse, disarticulation, is not necessarily dysfunctional. We will refer to a variety of case studies, among them previous studies in hospitals, research in "media space" environments and a current project on "telework", to exemplify distinctive contexts for communicative work. Based on this analysis, we will draw conclusions for the design of CSCW systems that support work within complex organisations.

2. Between articulating and disarticulating

People's "good reasons" for sharing or withholding information seem not only to be tightly related to the organisational structure and the nature of the tasks to be performed, they also reflect the political culture of the organisation and the environment into which it is embedded. Most of these "good reasons" for protecting or opening up are highly contested and contestable.

Much effort within CSCW (notably within the COMIC project) focuses on the support of articulation work in complex work environments. Complexity is understood as a result of the multiplicity of actors involved in a task, the distributed nature of these activities and the relative autonomy of actors in performing their part of a task. The idea is that technology be used for "reducing the complexity of articulating distributed activities of large co-operative ensembles by stipulating and mediating the articulation of the distributed activities" (Simone, 1993: 110). The authors introduce the notion of "mechanisms of interaction", abstract devices (such as plans, classifications schemes, procedures or schedules) that are embedded in a software application and provide generic facilities for articulation work. Articulation in this perspective is conceptualised as a work process or even a "supra work process" in its functionality for the performance of distributed activities.

The political and cultural context into which these activities are embedded (the coalitions people forge, the boundaries they erect, the relationships they activate or ignore) is implicitly dealt with in the "sharing and access policy" part of a CSCW system and/or in terms of roles which represent different sets of activities (Trevor, 1993). In this paper we seek to develop a conceptual framework which allows us to construct rich representations of "sharing and access" within and in between communities of practice. "Privacy" has some value here, but seems insufficiently to grasp the complexity of the issues at stake. It focuses primarily on protection against violations (of rights, sensitivities etc.) rather than on people's practices of

actively structuring the communication spaces they create, occupy, or have access to

We think that discussion of articulation work within CSCW has to be related to issues of the creation and control of collective communication spaces. The space metaphor we use here connects practices of sharing or withholding information to the location of (collective) actors, the cultural and geographical terrains they occupy, use and shape, and the zoning of these terrains in space and time. Like all representations the space metaphor is partial. It counterbalances the view of the world as a "seamless web" in which actors are in ceaseless, fluid, interactive motion. The spatialisation of social action "refers to those ways in which social life literally 'takes place': to the opening and occupation of different sites of human action and to the differences and integrations that are socially inscribed through the production of place, space, and landscape" (Gregory, 1994: 104).

Based on Hägerstrand's (1975) mapping of interactions in time-space diagrams, Anthony Giddens developed an analytical framework for describing the social organisation of interactions. He introduces two key terms: *locale* which "refers to the use of space to provide the settings of interaction, the settings of interaction in turn being essential to specifying its contextuality"; and *regionalisation* which describes "the zoning of time-space in relation to routinised social practices." "Locales may range from a room in a house, a street corner, the shop floor of a factory, towns and cities, to the territorially demarcated areas occupied by nation states. But locales are typically internally *regionalized*, and the regions within them are of critical importance in constituting contexts of interaction." (Giddens, 1984: 118f) Location captures the here-and-now situatedness of social action, including the specific vision this locatedness provides. Feminist theories insist on the presence and vision of particular subjects in geographically, culturally and historically distinct places, articulated in a "politics of location" (Haraway, 1991; Probyn, 1990).

Hospitals, for example, are highly regionalised interaction spaces with physical boundaries between different regions such as wards, the surgical tract, laboratories, kitchen and laundry. Most of these regions are inhabited by people with different occupational backgrounds and will physically never be entered by others. The interactions of physicians and nurses can be located in specific regions of the hospital, e.g. an outpatient department, in which they convene from different parts of the hospital to pool their knowledge for the treatment of patients. The regionalisation perspective spatially operationalises issues of interdependence and power. Patterns of access and exclusion in an hospital reflect a complex web of occupational hierarchies inscribed in the distribution of competencies and responsibilities.

Spatialisation, or the use of space, place, and landscape as categories for describing and analysing social interaction, helps us focus on the multiple visible and invisible closures of interaction spaces. It assists in identifying the dense, complex and multi-layered connections between people who are not necessarily co-present in space and time. Some studies of co-operative work implicitly build upon a space metaphor. So does Fagerhaugh et al.'s analysis of hazards in hospital care

in which they refer to "the fragmentation effects of specialisation (that) arise because multitudes of departments and layers and layers of workers must be coordinated within the chain of tasks necessary to complete a treatment or a diagnostic test" (Fagerhaugh, 1987: 14).

Regionalisation in their view is closely connected to the failure to articulate or "disarticulation" - "misassessing, mismonitoring, mistiming, misbalancing of risks, misrectifying, and miscommunication" (139). Disarticulation in complex organisations can occur due to the fact that disruptions of the work process can come from multiple and often interactive sources and affect multiple interrelated lines of work. In addition to complexity, there is a multiplicity of perspectives which are not necessarily shared but may be protected, suppressed or used to dominate others. Finally, not everything can be articulated, as "the errorless imperative", a strong and unreasonable demand for infallibility, shows. The collective communication space in a hospital is neither homogeneous nor complete nor equally accessible to all actors.

In their study of "heedful interrelating" on aircraft carrier flight decks, Weick and Roberts conceptualise a shared communication space which results from actors' ability to construct their own contribution to a shared task "while envisaging a social system of joint actions ..., and to interrelate that constructed action with the system that is envisaged" (Weick, 1993: 363). The envisaged system (e.g. for launching a series of aircraft in quick succession) emerges as the activities are interrelated. When interrelating and the images that feed it break down, actors' attention tends to focus on the local, rather than on the joint situation: "As interrelating deteriorates and becomes more primitive, there is less comprehension of the implications of unfolding events, slower correction of errors, and more opportunities for small errors to combine and amplify" (Weick, 1993: 371). Actors' communication space becomes fragmented, their vision partial and insufficiently connected to the perspectives and interpretations of others.

In contrast to these analyses which focus on the detrimental effects of disarticulation, we look at it in a more "neutral" way. We see disarticulation not just as a failure to communicate openly and effectively but as a phenomenon which highlights the fact that the regionalisation of communication spaces may help actors to get focused and/or to protect their view. In this framework we can think of a large computer network which links and interconnects different communities of practice as consisting of a variety of locales and regions, some of them overlapping. Access to these territories will be highly selective, depending on actors' strategies. What is articulated will depend on the properties of this communication space, its zoning and contextuality, while instances of disarticulation within this space can be interpreted as a consequence of both regionalisation and/or a deterioration or even breakdown of envisioning and interrelating.

3. Contexts of sharing or withholding

Our approach to understanding how the properties of communication spaces influence articulation work is to distinguish between archetypal settings. It is inspired by Weick and Roberts' analysis of high-reliability and high efficiency organisations (Weick, 1993). They argue that, in addition to structure and technology, organisations differ with respect to the microdynamics of interrelating and style and manner of performance. We wish to expand their distinction on the basis of our case-study material. Each of the four settings we discuss will highlight a specific set of relationships between organisational 'micropolitics', the structure of communication spaces and the technological support of articulation work. We speak of settings rather than of organisations since several types of settings may be found in one and the same organisation. The first setting, characterised by strong *occupational segregation*, is commonly found in large, mature, formal organizations operating in relatively stable environments. The other settings can be regarded as variations – *emergency* settings arise on occasions when action must be taken quickly in the face of high risk of serious failure; *scarce-resource* settings are becoming more common as funding, particularly in public sector organizations, is reduced; and *performance-intensive* settings emerge when there are strong competitive pressures.

3.1. Segregated terrains

A particular type of communication space can be found in Crozier and Thoenig's study of processes of organisational fragmentation. In their analysis they describe the fragmented organisation as building upon and also encouraging the development of a diversity of practices and perspectives. As such it reflects a recognition of the multiplicity of organisational realities. On the other hand it does not support the sharing of these perspectives. Often the information flow in these types of organisations is low and there is little direct co-operation. Although there are multiple dependencies, the games actors play are games of "defence, protection and non communication" (Crozier and Thoenig 1976: 550). Where actors cooperate, they build on complicity, based on shared mutual experiences and complementary interests

Hospital work typically takes places in a fragmented organisational context. Apart from the traditional subdivision of hospitals into wards, medical departments and a central administration, each of which constitute their own parallel organisation, medical specialisation and new technologies based on impressive machines have generated an increasing number of specialised services and associated work and procedures. Each of these groups, through their professional training and highly specialised work tasks, develop their own thought worlds and form distinct occupational 'milieus'. For instance, when we look at patients' location within this highly regionalised interaction space, we see that patients are frequently moved to and from specialised machines and areas. However, the knowledge of patients that has been interactively accumulated in one region of the

hospital does not follow their physical movements, unless special effort at articulating this knowledge is made. This multiplies the possibilities of misinformation and of confusion over the co-ordination of regionally distributed work.

Resistance against building a shared communication space across regions is strong. An example is the difficulties in dealing with technology-associated medical hazards in hospitals. In their analysis of safety critical situations in hospitals, Fagerhaugh et al. understand the present mismanagement of clinical safety as a result of the multiplicity of the domain (which may result in contradictory functional requirements) and of health workers' perspectives (Fagerhaugh, 1987). The complex nature of safety work, they argue, calls for much sharing and overlapping among the various services, departments and occupational groups within a hospital – nurses, medical specialists, a host of ancillary services, and multitudes of regulatory agencies with their distinctive guidelines. Each of these groups creates its own modes of perceiving and interpreting hazards and often holds discrepant views on basic issues pertaining to clinical safety and the work of maximising it. Practices of safety articulation are ill-developed. This is partly due to the fact that actors are not encouraged to build a shared understanding of clinical safety; partly it results from the distribution of safety work over regions that develop distinct contextualities.

In segregated terrains, people's communication spaces are highly regionalised. The records that populate these spaces are a product of selective co-operation, of access as well as exclusion. What is visible and shared throughout the organisation is carefully defined and restricted. This can be seen as an attempt at protecting special locations and the vision they provide from powerful, potentially overriding views and interests. This zoning also supports existing power structures and dependencies.

Shared communication spaces in such settings are typically restricted to local contexts where interaction is dense and levels of articulation are high. Articulation work across regions is confined to restricted communication channels and facilitated by standardized mechanisms of interaction. An example is a central application linking the hospital's wards with the laboratories and the pharmacy. In combination with an automated transportation system, it regulates the transfer of medical orders, specimen, diets, drugs and lab results. Forms, procedural rules, and thesauri provide some of the common ground for such border crossings.

3.2. Emergency (High-Reliability) Situations

While regionalization can help in the smooth conduct of routine operations, it can get in the way on the occasions when decisive action is urgently required. In health work, for instance, co-operative relationships are often centred around such acute situations. A "crisis" elicits patterns of dense co-operation and sharing which cannot be observed in the handling of daily routines. Practices of time-management also change dramatically as soon as an emergency arrives. The staff's ability and willingness to synchronise their activities and to improvise by circumventing

routine procedures of generating, retrieving and sharing information greatly differs from what is considered routine practice. These two temporal orders (and the associated practices) are selectively activated and they only partially overlap (Wagner, 1994).

Emergencies can be of varying kinds: they can be an intricate feature of a work situation as is the case in air traffic control; they also can occur spontaneously and unexpectedly, pushing people to extend their communication space in order to be able to cope with a problem. In some of the impressive examples of co-operative work in the CSCW field (such as air traffic control (Hughes, 1992) or the London Underground control room (Heath, 1992)) routine procedures seem to incorporate the experience of emergencies and their handling. Staff's level of peripheral awareness of each other's work is such that they can immediately evaluate and react upon an incident. Emergencies require the kind of interrelating which Weick and Roberts see as typical of high-reliability organisations in which errors can have fatal consequences. Often this is coupled with a preoccupation with perfection - activities need to be perfectly attuned not only to avoid mistakes but also to keep the unfolding flow of events comprehensible.

Although emergency settings create a strong incentive for building a shared communication space, instances of disarticulation are widespread and in some cases (such as aeroplane crashes) attract a lot of attention. In their analysis of such an incident, Weick and Roberts offer a detailed description of how the boundaries of actors' shared communication space (or in their language: "collective mind") were drawn more and more narrowly and their ability "to envision their contributions in the context of requirements for joint action" (Weick, 1993: 373) broke down. The incident happened during a night-time launch and recovery of several aircraft, a typical emergency situation. A cumulation of incomprehensible events made interrelating more and more difficult. Actors and activities became isolated and the system of distributed action rapidly lost its form. This is an example of how a shared communication space is split into ill connected fragments that no longer support a vision of the whole task.

In emergency situations, the communication space need not be restricted to the immediate local context. Examples of this can be found in the uses of corporate bulletin board systems and groupware products such as NOTES. There are reported cases of technical personnel posting requests for help on particular problems, and quickly getting pertinent responses from others scattered throughout the corporation. Similarly, reports on Internet news groups give examples of immediate, focused attention on certain topics. The August 1993 issue of Newsweek describes how participants of a parent support group distributed throughout the US helped someone through a family crisis. During the most dramatic phase of the war in Slovenia, an academic network (Usenet) was spontaneously converted into a means of distributing the unofficial views of independent individuals and of providing personal and moral support to colleagues (Lubich, 1993). These are examples of spontaneously formed communication spaces for people who otherwise would not have had the incentive nor the opportunity to reach out at each other. The Slovenian case is particularly interesting

since an already well-defined communication space for scientists was extended to journalists who quickly became aware of the value of this source for their assessment of the situation. There was even the notion of "misuse", questioning the right of people to appropriate an electronic forum which was designed for academic exchange for their political and personal purposes (Wagner, 1995).

Regionalisation is low and boundaries permeable. In a segregated environment, such as an hospital, emergencies are handled by pooling knowledge situationally and locally without touching upon those boundaries and selected cooperations that govern routine interactions. Even in a control room context (connecting a variety of physically separated locales), there are distinct regions which are reserved for specific sets of actors and events. Still, boundaries are 'spongy' and relationships between distant actors can be easily activated through a variety of communication channels and a broad array of mechanisms of interaction (prespecified as well as open and flexible). In emergency settings we will often find rich common artefacts (Robinson, 1994) which support the envisioning of the whole task and capture as much contextual information as possible.

3.3. Scarce-resource settings

An increasingly common variant of occupational segregation are scarce-resource settings. The scarcity of time, money, people, technologies, or access to information may constrain the performance of an organisation and create a strong pressure to co-operate and share across boundaries.

A good example is reported by Sørensen in her account of an action research project in a Norwegian hospital. At the start of this project, the staff was clearly reluctant to make performance data explicit and to share them with other organisational units. As long as this fear prevailed, surgical departments suffered from recurrent severe bottlenecks. Patients had to be sent away and the hospital lost part of its income. A major step forward was taken when the responsible head nurses came to realise that sharing information would help them to cope better with their dwindling resources. They initiated the development of a small computer system whose main rationale was to provide an overview of the actual and projected need of resources which would otherwise not be available (Sørensen 1993).

This example also shows that a strong incentive for complex organisations to strengthen co-operation are economic sanctions in case of under performance. Distributing resources according to achievement criteria which apply across individuals or groups, provides motivation to share, adjust flexibly and negotiate. For example, in the Norwegian case all patients in the waiting list that have not been treated within six months (and the income that they would generate for the hospital) are transferred to another hospital. This may result in a substantial loss of resources (e.g. a unit may lose some of its already scarce nursing staff).

Scarce resource settings can be found in many types of organizations, apart from the highly segregated environments illustrated by this hospital case. The patterns that characterize them are distinct, as cooperative relationships center around the

need for negotiating and aligning resources, often under time constraints. Representations of work are partially integrated. They provide an overview which both exposes units and individuals to scrutiny and assessment from outside and helps to limit the risk of an unexpected shortage or variation of resources. They connect different regions (e.g. surgical departments), allowing actors to envision them as a system of shared resources and to interrelate their planning of operations and personnel. A key feature that supports this cooperation is the common stake that participants have in the outcome. If there weren't trusted assurances of relatively equitable outcomes, such as those offered by job security or adjustment provisions, there would be much less incentive for individuals to give up exclusive control of their local resources.

3.4. Performance-intensive settings

Surgical teams and air traffic controllers are good examples of settings in which high performance levels are required for the monitoring of risk situations. Other types of performance-intensive situations are more difficult to assess with respect to articulation and disarticulation.

In her account of the design of a prototype "electronic file cabinet" for a law firm, Lucy Suchman discusses the "good reasons" of Mark, a lawyer who has built up an enormous "private" paper file together with highly developed text searching skills, for making this file electronically available and searchable to everyone in his firm (thereby renouncing his information monopoly). As in many other organisations, there was a strong and increasing pressure towards "high performance." This is closely associated with management's interest in making individual expertise more readily accessible and exploitable in the pursuit of profit..

A good example of this pressure is to be found in Quinn and Paquette's account of a global management consulting firm, which they characterise as a "spider's web" organisation. It has been building a database that systematically captures the histories of its contacts with clients and practical solutions for special problems (Quinn and Paquette 1990. 73):

The firm operates in a highly decentralised, real-time mode. Each local office is as independent as possible. Partners say that AA&Co's distinctive competency has become "empowering people to deliver better quality technology-based solutions to clients in shorter time". ... Yet professionals who leave AA&Co immediately lose access to its system and accumulated experience

Within wide ranges, each node (team) may function quite independently in serving a particular client base. However, in certain circumstances, the individual nodes may need to operate in a highly co-ordinated fashion to achieve strategic advantage for a specific purpose.

People working in performance-intensive settings often have to operate in a "profit-centre" mode. Case studies of information-sharing practices in two large computer firms (work in progress) suggests that in such situations people often endorse and practise "open access" strategies. The growth of LANs, personal but shared databases, and Internet connections is part of this strategy. It reflects people's need for immediate access to a wide array of distributed standardised

information as well as informal information, in order to be able to act as 'high performers.' However, as Orlikowski (1993) observes in her study of a firm remarkably similar to AA&Co., unless such structural properties as reward systems and workplace norms are consistent with openness and sharing, the desired collaboration is unlikely to emerge.

Redrawing regions

A particularly good example of how performance-intensity influences actors' communication space is the case of a software house which has started to shift part of its employees' activities to their homes¹. In-depth interviews were carried out with eleven of its staff, most of them marketing specialists for different types of clients as well as some systems engineers. These people's tasks largely consist of well-defined, short term "actions" which require considerable co-ordination effort, but there is little time and social space for managing tasks co-operatively. This in turn strengthens people's dependence on technical support systems such as computer networks and the variety of services provided through them. Over time, people who in another type of organisation would have managed their "action items" in intense, partly face-to-face co-operation within a team and across organisational units, have come to rely almost entirely on their own capacity for self-organisation, backed up by a shared information system.

Practices of self-organisation are reinforced by the company's reward structure. Rewards are extremely output-oriented. Employees are not paid primarily for the time they work, but for their results. Much of the effort spent on creating organisational and technical support for colleagues within the company remains invisible and unrewarded. Relations with clients have clear priority over internal contacts. Patterns of communication and co-operation reflect the fact that employees operate within this "weakly attenuated" social environment. A particularly interesting feature of this environment is the use of network-based services, above all email. Email is heavily used for managing time and tasks. All employees have access to individual electronic calendars and discipline in updating seems to be high. When people have very little shared time in the office, this opening up of individual calendars becomes vital. In order to be included in ad-hoc meetings and at the same time to be able to call in an urgent meeting, people simply have to share information about their individual use of time.

Email is valued as helping to increase the completeness and reliability of information, even among people who are spatially close to each other. Requests in the cafeteria or in the corridors are often not answered unless written up and fixed on email. Email is also associated with a certain communication discipline. People expect others to concretise their requests. For managers, it has a documentary function and helps to ensure consecutive action. Even people who have agreed on something on the phone or face-to-face use email to confirm. Email is also used for

¹ This case description refers to ongoing research by Andrea Birnbaumer, Martin Kompast, Hilda Telliglu and Ina Wagner, Abteilung für CSCW, Technische Universität Wien.

establishing discipline, e.g. through forwarding reminders to a person's manager - as one of them phrases it "a wonderful escalation tool which really works" (KL, 15).

The telephone is the second most used communication tool in this environment. People call each other even if they sit in adjacent rooms. A switchboard operator is responsible for the efficient routing of incoming calls. She and a system of voice boxes are trusted with ensuring availability to important contacts (mostly clients). Portable phones make it possible to use otherwise unused time (e.g. en-route in a traffic jam) for answering urgent calls.

Moreover, much of the most important information is no longer provided by the co-inhabitants of people's office but by spatially distant partners. This culture of communication reflects an organisation which expects its employees to develop a high level of self-reliance and self-organisation and provides little time and space for the social management of tasks. The whole array of technologies available to its employees is designed to support "the parallel management of multiple tasks" at a distance. Co-presence is no longer a specific value. On the contrary, it is often associated with disruption, overload, and unwanted intrusion. Protecting and drawing boundaries in such an environment is connected with the danger of cutting oneself off from a multiplicity of only partially knowable and predictable sources.

Comparing this environment with a performance-intensive, but occupationally segregated setting highlights some of the differences between organisational communication spaces. In our case study on scheduling surgical operations, for example, introducing a shared electronic calendar was a highly contested issue. In particular, the group with the highest level of time autonomy, surgeons, had the power to insist on keeping information about their availability private, while nurses and anaesthesiologists voiced an interest in making their use of time publicly visible (Egger and Wagner 1993). Temporal transparency was constrained by the hospital's hierarchy and compartmentalisation. There is a strong contrast between the communication space for the planning of surgical operations in this clinic which remained strictly regionalised, and the level of simultaneous envisaging and interrelating attained locally, in the operating theatre.

Overriding personal boundaries

Whereas the previous example showed how common electronic spaces could support articulation work across physical and temporal locales that were increasingly regionalised because of growing performance requirements, a field study conducted by Laura Garton (Garton and Moore 1994) suggests that this approach can be taken too far². The study, involving an experimental use of media space technologies to link the central and satellite offices of a small research institute, provides a vivid example of difficulties that can arise when open

² This account draws heavily upon materials presented by Laura Garton and Gale Moore at the CSCW'94 Workshop on Critical Considerations in the Creation and Control of Personal/Collective Communications Spaces, Chapel Hill, NC, October 22, 1994. We appreciate their willingness to allow us to make extensive use of this insightful report

communication spaces are overlaid across disparate physical, status and personal boundaries in response to a desire for intensified performance.

The technologies involved in this case were developed with the aim of gaining early insights into the social implications of media space technologies through rapid prototyping, and workplace-based field research. The prototype media space is a form of Multi-Media Communication Service (Clement 1994, Dourish 1993) and interconnects a variety of technologies such as video cameras, microphones, VCRs, and computers, and a variety of spaces such as conference rooms and offices, providing services such as video-conferencing.

The principal field trial of the media space took place within a research administration organisation, whose primary work is to support the growth and development of a regional IT industry. Funded on a contract basis, this organisation was under constant pressure to demonstrate its effectiveness and promote 'leading edge technologies.' The Director and most of the other 11 employees work at the headquarters, while the Associate Director and one site co-ordinator work in a satellite office located beyond reasonable commuting distance. The recently hired Director, who had a background in marketing came to see the media space as a way to advertise the mission of the organisation, and hopefully to help create technologies that 'empower human beings'. The Director believed that the office in the periphery would like to be more involved and in touch with the core group at headquarters.

The Co-ordinator at the satellite office considered the work as independent from headquarters and prior to installation, did not feel the media space technology was needed to accomplish work tasks. A personalised desktop video connection between sites was viewed as uncalled-for: it wasn't necessary to get on a TV to talk to the headquarters staff about ordering supplies. It also seemed like 'Big Brother' and the Co-ordinator didn't want to spend extra time with what would likely be lengthier interruptions from headquarters. Coupled with the concern that the media space would cost extra time was the concern that the Associate Director might become too available for more work from the Director. Since the Director had come on board it seemed they were swamped and the Co-ordinator felt discouraged about the whole idea that headquarters would have more access to them at the satellite site. From the Co-ordinators perspective, lack of access to headquarters was not a problem. Rather than improve connectivity through the media space, the strong preference was to manage the connectivity they already had. The Associate Director assumed the role of protecting staff from the direct requests of headquarters and supported staff attempts to control the work flow.

With this set of social relations between the periphery and the core, when the media space was installed, the Co-ordinator simply closed the electronic 'door', thus indicating unavailability via the software. Masking tape applied to the camera lens ensured no unwanted viewing, and was eventually replaced by a camera lens cover. Interestingly, the closed 'door state' behaviour was not considered particularly unusual by the staff at headquarters. They referred to the satellite office Co-ordinator as someone who prefers to work separately from central office. Even though no one else kept their door state closed, this behaviour was not considered

deviant or even particularly noteworthy. As long as there was access by phone or email, no one expressed concern.

However, with the Associate Director connected to the Director via the media space, the periphery was no longer as isolated as it had once been. The Associate Director who was an early promoter of the technology because of its ability to reduce travel needs, was also generally pleased with the new accessibility to the Director. In fact, both parties felt the system was invaluable during the first summer of operation when they had to make a number of important budget decisions, such as staff allocation for the upcoming year. However, toward the end of the summer the Associate Director's enthusiasm for the system began to wane. There were times when the Director 'popped' into the office unannounced, and once during a phone call remained 'on the desk' until the call was finished. The Associate Director found these spontaneous episodes somewhat disconcerting and not quite what had been expected when anticipating a 'shared workspace'. At that time, the Associate Director may have felt it was not judicious to adjust the door state and thereby make explicit to the Director a desire to maintain more control over this new shared work environment. Instead, the Associate Director would occasionally disconnect the camera. This resulted in the person who was trying to connect to get a message that there were problems with the video connection. The general interpretation by the caller was that there was some sort of system failure.

Since the system, a research prototype, did on occasion fail, it became an accepted belief that the media space technology was not reliable. This grey area of system reliability allowed users to manipulate their accessibility without using the more explicit protocols of door states. For the technical group it unexpectedly became a support nightmare trying to disentangle what was a true technical problem, from a technical problem due to something not under their control, or what was possibly deliberate 'sabotage' by a user.

We see in this case an example of how a CSCW application, introduced on the presumption of the value of seamless communication, interferes with the prior and apparently legitimate patterns of regionalisation, and leads to some technical dysfunction. We can also see how, in Weick and Roberts terms, the lack of shared vision (of a particular form of organizational functioning) can lead to a deterioration of interrelating to the point that measures, such as resorting to lens covering and plug pulling, became desirable.

The technical features that were built into the system to afford some degree of protection against unwelcome intrusion and exposure, proved to be only partly successful. A more careful attention to the social dimensions of the communication spaces and in particular a more critical examination of assumptions concerning the overriding of boundaries would be helpful. In this experimental setting, such unintended consequences are to be expected and may be handled through ongoing adjustments, but it is likely that in more conventional settings there will be similar needs for continuing adaptation. In performance-intensive settings people have strong incentives to build up communication spaces which help them to envisage and interrelate while acting for a common task and/or to have access to a multiplicity of only partially knowable and predictable sources. Still, regionalisation

in such settings is variable, depending on the situation and on power relations. The representations of work of superiors are not necessarily as open and immediate to subordinates as they are the other way around.

The four settings discussed above are not distinct in all dimensions, nor are they mutually exclusive. Rather, they highlight specific sets of relationships between tasks, organizational culture, the structure of communication space and technological support for articulation work. Table 1 summarizes some of the main differences and similarities between these archetypal settings.

Table 1: Archetypal settings - sets of relationships

	SEGREGATED	EMERGENCY - HIGH RELIABILITY	SCARCE RESOURCE	PERFORMANC E-INTENSIVE
Incentives for articulation	intense local interaction boundary crossings	grave consequences of error in acute situation need for perfection	scarce resources economic sanctions	high pressure to perform economic rewards
Incentives for disarticulation	highly specialized perspectives protecting a particular vision, practice	deflect blame claim credit	hoard local resources	information overload protecting personal boundaries
Regionalisation	high - on the basis of functions & occupational milieus	low, or flexibly adaptable (at least temporarily)	high, restricted openings	variable, depending on situation
Representations of work	specialized & fragmented partial connections	support envisioning of whole task	partially integrated	open, immediate access
(Technological) support of articulation work	local applications restricted communication channels formalized mechanisms of interaction	open networks rich common artefacts broad array of mechanisms of interaction	resource-sharing facilities	open networks shared databases and planning tools telepresence arrangements

4. Implications for the design of communication spaces

Computer technologies can be seen as opening up new communication spaces, as influencing the distribution of encounters in these spaces, and as supporting the definition of regions and of transitions or barriers between them. One important part of design work is to identify regions and the connections and boundaries between them which may be professional (reflecting the needs of different local communities), political (e.g. seeking protection against powerful actors), or personal. As Schmidt and Bannon (1992) argue, "visibility must be bounded" in order that individuals' activities not be overexposed, but some of these preserves will be more legitimate than others.

Part of the challenge facing developers of CSCW applications that are sensitive to the needs for both articulation and disarticulation, is to distinguish between technically and socially focused prescriptions. There is a common and well founded presumption that the technical infrastructure to support communication should ideally present as few barriers as possible, that it should be 'seamless' in its connectivity. However, this does not necessarily mean that the actual human communication would not often benefit from maintaining barriers and divisions. As we have shown, there may well be very good reasons for doing so. This suggests that there should be technical facilities for allowing participants to erect, shift, blur, harden, dissolve, and strengthen the boundaries to communication spaces. This is already done in conventional (non-electronic) communication spaces by drawing upon the rich resources for accomplishing this that are afforded by the physical world (walls, partitions, locks, windows, doors, furniture placement, etc) Providing electronic communication facilities should then not be seen only as offering ways to surmount obstacles but also to permit people to rearrange communication spaces according to their changing needs, wants and desires.

The spectacular success and obvious shortcomings of email are instructive here. Because the basic email transactions are dyadic, between a voluntary initiator and an explicitly designated recipient, many of the difficulties outlined above are avoided from the start. Email, in effect, facilitates the spontaneous ad-hoc creation of very many two-person communications spaces. Distribution lists of various forms expand the membership, but participation typically remains voluntary and the boundaries defined by explicit subscriber lists. It is when messages cross these borders that controversies arise – senders accidentally send to the wrong person, a recipient forwards to a third party, a supervisor monitors employee email traffic (giving rise to some high profile court cases in the US), archived messages thought to be deleted serve as incriminating evidence (perhaps just as well in the case of White House agent, Oliver North).

As electronic systems are refined to support various forms of group communication more specifically, then greater attention must be paid to questions of boundary management – especially who is within (and outside) the space for particular types of communication, and how spaces may be linked across the

borders. Of course, providing the technical means to define communicative regions under individual and collective control alone is not adequate, as the media space example showed. Very much depends on the social processes by which the participants can bring their own informed voices to bear.

At this point we can only offer a "metaphorical approach" to the question of how to integrate "flexible regionalisation" into a CSCW system. We might envision a layered map of actors' communication spaces, the first layer showing the shared terrains, their contours, the actors and objects that populate them. Successive layers may be more detailed, affording an overview of regions and selected connections between them, or representing the views open to different sets of actors. Negotiations would then result in operations such as visibly removing a barrier, displacing objects, introducing one-way roads and dead-ends, and inserting temporal constraints for certain actions.

Our point is not to say that in general there should be more or less co-operation, openness, withholding, and so on. Rather, CSCW design should take account of the regionalised character of "real world" communications and by offering tools for creating a corresponding multiplicity of communication spaces, provide the technical basis for the necessary negotiations between the actors involved.

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