

## The Hidden Work In Virtual Work

Heinrich Schwarz  
M.I.T., Program in Science, Technology, Society  
Cambridge, MA, USA  
schwarz@mit.edu

Bonnie A. Nardi  
AT&T Labs-Research  
Menlo Park, CA, USA  
nardi@research.att.com

Steve Whittaker  
AT&T Labs-Research  
Florham Park, NJ, USA  
stevew@research.att.com

*This is a draft of 1 June 1999. It is a longer version of a paper going to be presented at the "International Conference on Critical Management Studies," in Manchester, UK, July 14-16, 1999.*

*[Please do not quote or cite without permission]*

### *Introduction*

Currently we are witnessing a steady stream of images, stories, reports, and accounts of how work is being transformed in an information economy. These narratives, told by the popular media, the business literature, by consultants, and in advertising, tell us that with the help of current and emerging information and communication technologies, we will be able to work with anybody, at anytime, from anywhere, in more flexible ways, with more freedom, and above all, we will be more efficient and productive.

Against these assertions of the discourse of flexible, mobile, temporary, and virtual work, we want to demonstrate in this paper that the transformations to new forms of work are far from costless. Based on empirical findings and theoretical arguments we lay out that much effort and extra work is necessary to make these new forms of work viable - work on the side of organizations, but more pronounced on the side of individuals. We identify and present three different kinds of this additional work, which we call 'net work', 'boundary work'

and 'technology work'. Borrowing concepts from science and technology studies we claim that these extra kinds of work are being rendered invisible by the discourse of virtuality and that this deletion serves a function and carries consequences. In addition, we wish to demonstrate how this erasure tends to simplify and naturalize fundamental concepts such as 'team' and 'communication', since in practice a stable team is not pre-given but the goal of a constant stabilizing effort.

### *The discourse of virtuality, flexibility, and mobility*

The magazine advertisement shows a busy urban traffic scene, with cars, trucks, and pedestrians; the black-and-white and zoom perspective of the photograph accentuates the crowded, hectic, and confusing character of the situation. The text, written over the picture in irregular and hard to read type, as if shaken out of shape by the noise of the street and urgency of the moment, reads: "You have 20 minutes to make an appointment at an address you've never heard of." The bottom third of the page depicts the solution to the problem and the resolution of the plot: a piece of technology, a little device for cars with a GPS (global positioning system), a map display, and the words, "We'll take you there." With the right device, new locations and new cities are no longer a problem for the mobile traveler and business person, according to this ad.

Another ad promotes a software application. Two images: to the left a cramped and hectic looking office in black-and-white with a white cut-out shape of a man in the middle, as if he was teleported away. To the right a comfortable, clean, aesthetically pleasing living room in warm red and brown colors with the man copied right into the middle. The sentence "put yourself in a more productive place" runs across the page. The product is *pcTelecommute*, a software application to support working from home. Text underneath the images claims that the software "has everything you need to work from the one place you can get things done - at home". The text speaks productivity, the image pleasure. With technology, the message goes, working from home can both be more enjoyable and more efficient, with technology we don't have to be in the distracting office, we can work in a more comfy place, do "everything" as well as if we were actually there - and be more productive on top of it.

Business consultants are also articulators promoting progress through virtualization. In a peculiar evocation of history two experts on virtual teams acclaim in their book of the same title that "for the first time since nomads moved into town, work is diffusing rather than concentrating ..." (Lipnack 1997); more specifically, they claim that "for the first time, teams can virtually collocate all the information they need to work together and put it all in context". Although at times the authors seem to appreciate the difference between virtual and traditional teams, they are in awe of the potential of the novel technologies: "distance spanning communication tools open up vast new fertile territory for 'working together apart'". With just the right management, then, "virtual teams are a strategy for success".

In *Free Agent Nation* former White House speech writer Daniel Pink celebrates what he calls the movement towards free agents: "There's a new movement in the land - as fast growing as it is invisible". Free agents are the self-employed, contractors, and consultants who turn their back on the alienated working conditions, "dysfunctional workplaces", and the growing insecurity of corporate America. Free agentism, he claims, results in more money, more freedom, and more security. It promises more identity, authenticity, and wholeness. Pink quotes one of his free agents as follows: "unless you are into self-abuse, or you're incredibly lucky and avoid restructuring, being a lifer is no longer an option." (Pink 1997) Escape from prison into the freedom of loose and temporary business relationships.

These are just a few examples of visions of a world of more flexible, mobile, temporary and technologically mediated work. There are many more: as marketing imagery, as journalistic reports from the world of work, as presumably well-researched case studies and theoretical analyses in journal articles, as popular culture thinking, as lunch talk in business circles, as themes of conference and magazine launches, as explicit goals for organizational restructuring policies and implicit bases of technology designs. Despite a certain heterogeneity of players, agendas, and resulting pictures painted, we nonetheless believe there is a view on the future of work in the digital economy that shares major assumptions, perspectives, and goals.

This view portrays the world of tomorrow - or is it already today? - in which we work from anywhere: not just the traditional office, but our homes, the beach,

the car, and whenever we want; in which we work on temporary projects with people from different organizations at different locations; in which we leave our long-term employed relationships behind and contract and consult instead through temporary and fluid business relationships; a world of work, in other words, in which we work as telecommuters, home officers, working nomads, road-warriors, and free agents in virtual offices as part of virtual teams in virtual organizations.

In this view these shifts are seen not only as an inevitable but a desirable answer to the challenges of a globalizing economy, intensified competition, and increasing speed of technical change. Most of all, these transformations, made possible by advances in information and communication technology, are promoted as more efficient, productive, and essentially without costs. In other words, what emerges from many of these individual stories, images, and representations is an optimistic discourse of mobility, flexibility and virtuality. Without loss, so the message implies, we can replace fixed workplaces, collocation, long-term and synchronous collaboration with anywhere, anytime work and virtual teams (Illingworth 1994, Mitchell 1995). And stability, permanence, and fixity in work relations and office design should give way to flexibility, temporality and fluidity. As a result there will be less hierarchy and more freedom in a faster, more fluid and flexible postindustrial society.

We call this view a discourse because there are a variety of signifying practices playing together here, not just linguistic ones, but also material and socio-institutional ones: implicit representations embedded in policies and technologies originating with organizational managers, software developers, technologists, and real estate managers for example.<sup>1</sup> Although the discourse is about mobility, flexibility, temporality, and virtuality, we will at times use the abbreviated phrase, discourse of virtuality, in this paper to stress its technologically mediated, information based, and disembodied character.<sup>2</sup>

---

<sup>1</sup> This notion of discourse is close to Paul Edwards' use in his astute analysis of the closed world discourse (Edwards 1996).

<sup>2</sup> Taking cultural critic Katherine Hayles' definition of virtuality as the cultural perception that information is separate from but to be privileged over materiality, as a starting point, all views that disregard the embodiment of work activities and work relations while overestimating their technological base can be called virtual. Such thinking underlies most of the visions of mobile, flexible, temporary work that we refer to here. (Hayles 1999, 13, 18)

### *The network study*

The empirical study that this discussion is based on was conducted in the Silicon Valley region in the second half of 1998.<sup>3</sup> We were interested in how people worked together across organizational boundaries, when geographically dispersed, and under conditions of flexible, often short-term business relationships and high mobility. We specifically wanted to understand the role of information and communication technologies in people's work.

In the end we studied twenty-three informants, some in their twenties and fifties, but most in their thirty and forties, and equally men and women. They were well-educated and highly technically literate, and most of them professionals. The sample included job titles such as TV producer, web designer, marketing specialist, multi-media producer, appeals court lawyer, non-profit consultant, technology transfer manager, and commercial video director. The study participants worked in a variety of industries with a concentration in telecommunications, media, and high-tech, especially software and Internet, for example a multi-media company that specialized in web-site, CD-ROM, and game production. The companies ranged from large (> 10,000 employees), to medium sized (100-1,000), to small (1-30). Our sample included independent contractors/consultants, business owners, and employees, from CEO to a secretary.

The study includes qualitative, semi-directive interviews conducted mostly at informants' work-contexts with follow-ups, and several days of quasi-ethnographic observations (altogether we collected over 1000 pages of transcripts).

Our sample was not chosen in a random way but developed through personal contacts and recommendations.<sup>4</sup> It is not representative in a broader demographic sense, but biased towards the highly technically literate and the well-educated. This bias, of course, is shared by most workers in this geographic

---

<sup>3</sup> The study was part of a larger project within the Human Computer Interaction Department at AT&T Labs-Research, in New Jersey and California.

<sup>4</sup> Thus, not surprisingly, the study made use of the same socio-professional network structures that became one of its important findings (see below).

region, in particular the information and knowledge workers who are most likely to work under the conditions investigated.<sup>5</sup>

### **The work of flexibility, mobility, virtuality**

We chose our informants because their work lives in one way or another fit the image of the new economy of mobility, flexibility, and virtuality: some telecommuted a couple of days per week, others juggled different work sites across the continent, some worked in a variety of groups with members in different locations and organizations, others traveled extensively, a few had become consultants or were self-employed working out of their own homes, others were contracting, still others were on projects with a number of semi-independent constituencies. Not surprisingly, their work situations were also characterized by the other markers of the new economy: an accelerated pace, dynamic constellations of professional relationships, and an increase in the use of technology in their work. Through our study we learned what extra effort was necessary to get work done under these conditions. Of the three categories of this extra work we want to draw attention to -- *net work*, *boundary work* and *technology work* -- net work is the one that characterizes best the new condition of work.

#### *Net work*

In general, 'net work', or "netWORK" (see Nardi et al. 1999), describes the intensified activities, practices, and strategies of building, maintaining, and managing the new socio-professional net-work-like structures -- structures, that seem to have become increasingly essential for many of our informants to do their jobs and maintain their professional careers. There are two kinds of networks and thus two meanings of the term 'net work' that we want to discuss here.

---

<sup>5</sup> As most qualitative research, from case studies to ethnographies, our findings are not easily generalizable without further research. We are convinced, however, that what we found seems typical for many people in the San Francisco and Silicon Valley region and the industries studied. We further believe that our results capture a development still unfolding, which for the moment is still more pronounced in certain regional and sectorial pockets, but will spread further to less elite parts of the population.

The first refers to the management of longer-term professional networks. Workers in the new economy, like our informants, find themselves less and less in tight institutional and organizational structures with determined futures and stable, long-term, bounded, and secure work contexts -- which may soon become the nostalgic icons of a past world (Bishop 1999). Driven by a variety of factors -- more frequent job changes through downsizing, mergers, and the waning of whole industries, voluntary job switching, more intense interrelationships with people outside one's own organization and context such as clients, alliance-partners, and non-organizational team-members, and rising self-employment - the significance of the corporate environment and its structures is on the decrease. The new socio-organizational environment for an increasing number of people in the rapidly shape-shifting workscape of Silicon Valley, are socio-professional networks of people that consist of current, former, and potential future colleagues, clients, consultants, lawyers, contractors, information sources, accountants, friends, and tech support -- people one wants to work with, used to work with, or who are useful in any other way.

All of our informants drew in one way or another on these extensive personal, social, and professional networks for making current business successful, finding new business, acquiring necessary knowledge, or making new contacts, and thus extending the network further. Most invested considerable effort in keeping up these structures.

Kathy<sup>6</sup> was a marketing and communications consultant in the high tech industry who had worked for about ten years for consulting firms and in-house at companies before she started her own business out of her house in the Santa Cruz mountains. She explained that apart from skills that she needed to acquire, it was mainly a network of people that was a prerequisite for her becoming self-employed. It took her ten years "until I had a network set up--not a computer network, but a network of people, of acquaintances and such." Kathy's network helped her to get new jobs through referrals or her own active acquisition. She also drew on her network when she needed to cooperate with other consultants or contract out certain work herself. She actively cultivated these relationships by regularly staying in touch.

Interviewer: *Now, this network that you described--*

---

<sup>6</sup> In the tradition of anthropology we protect the identities of our informants by using pseudonyms.

K: It's people who I have worked with, both in companies and in consulting firms, as well as clients that I have worked with, and it's also editors, or other industry people that I have worked with, and I have proven to them that I do a good job, so if someone called them, "oh, I'm looking for someone to help me with this situation" if I fit that qualification, they'd call me.

*Yeah. So how many are there?*

Oh, well that's a good question! (pause) Um, I would say there's a good 50 people that I would say I communicate with at least twice a year just to keep in touch with.

*What does that mean? How do you do that? You call them up, say, "hi, how are you?"*

[...] Just by e-mail lately. It's been just, "Hi, how ya doin'" or I pick up the phone and go to lunch with them. Going to lunch or breakfast works really well.

In her case the work to keep the network alive and functional does not seem particularly hard, but it nonetheless is an essential part of the existence of a consultant working from home. Martha's network looked more tiring. She was a freelance journalist in the process of establishing a career in the Silicon Valley region writing about technology and culture issues for European magazines and newspaper. Her most important relationships were with the editors of the publications she attempted to do business with on the one hand, and her informants, on the other. She explained how important her database of about 300 entries had become and how painstakingly she kept book of all the relevant information (devoting about one day per week to office work):

Every calendar entry of mine, like I would spend a lot of time updating those and it's been invaluable. I mean I have backup copies on different places, because if that would be lost, I'd lose probably, whatever, at least \$20,000 just in a month, you know, to get that all back. Basically, each entry has not only all address, contacts, phone, fax, it has a little note telling what they like, what they want, what they don't like, what they pay, what they normally pay, what they pay to me, what I've been able to bargain, and what's the line length, and how many characters per line they have, because they hate that if they have to tell you this twice. So that is like a main asset, and I was told by other free-lancers and I started that right away. [...] And any little E-mail I get from somebody else in the house, I take immediately address, everything down, it's like a total compendium.

Similarly, Ed, an independent TV producer, had worked with a large number of people over the years. He explained his need to leverage these acquaintances for current or future work:

"I need to be able to track them back or whatever. Art directors, artists, you know, people that can draw in a certain way. People that could give me money. Lawyers; people that take away my money."

These networks are long-term and potentially rather extensive - they ranged from 500 in Ed's case to about fifty in other cases. At the same time they are dynamically shifting structures that constantly change in size and quality: bonds loosen and strengthen, new ones are being added, others given up. The networks

are heterogeneous in that they comprise different people and kinds of relationships that are more or less active, frequent, intense, or personal. They are social, professional, and personal at the same time, since they go beyond purely instrumental and task-oriented relationships, include friendships, and are formed around the needs of one person.<sup>7</sup> For a further discussion of such "intensional" networks and their emerging role as primary structural context and social reality of work see Nardi et al. (1999).

As these examples illustrate, for our informants working depended on building, maintaining, and managing networks of people, as well as knowing, remembering, and leveraging them. If a career in fact used to be, as the etymology of the word suggests, a straight ahead journey on a firmly paved road (see Sennett 1998), now, that this road is falling to pieces, the career becomes a zigzagging cross-country ride which needs to be supported by a flexible network of paths, bridges, and short-cuts that has to allow constant changes of directions. Thus, net work as we understand the practices of making connections, updating relationships, organizing information about contacts, "refreshing your list" (Carl, public relations, TelCo), keeping in touch, and remembering who could help with a certain work, has become an essential and constant activity.

### *Net work in work-nets*

The second meaning of net work refers to the efforts to micro-manage the actual configurations of people during projects, the actual work-networks, the daily structures and constellations of working together that we call *work-nets*. While the socio-professional networks as described above are latent or dormant from the perspective of actual work practice, work-nets are active, and often activated and recruited from the resources of the former. Yet, although made of parts of multiple interacting socio-professional networks, work-nets are no

---

<sup>7</sup> In theoretical terms, we distinguish these socio-professional networks from communities of practice, in that the latter are defined by shared practices and similar professional identities (Lave 1991, Wenger 1998), while the networks that sustain the new flexible, mobile work realities are less homogenous and reach across various communities of practice (see Østerlund 1996). They also differ from other concepts of work-related social structures, such as 'knot-working' (Engeström 1999) in their long-term duration and person-centered quality. Finally, these networks are not like regular communities based on common interests (Wellman 1998), since the participants or members may have nothing in common except a relationship to one person.

longer egocentric, rather they resemble dynamically changing overlapping netted structures of people. These configurations are far from the notion of well-defined, bounded teams with common understanding and shared goals.

Laura owned and managed a small company that does documentation and training for large high-tech companies. She had a few employees but hired contractors and consultants in different places for her projects as needed. She described one of the projects her company was working on. It was about the production of a training intranet and involved four different client sites, a number of employees of the client's company who had to provide content input for the intranet, a few employees of her company, and an increasing number of contractors, who may work from home, at the client site, at Laura's company office, or in a different city altogether:

"So the teams are dynamic in that sense. The teams are dynamic in the sense of people just move around within the organization, and there's just natural attrition and things like that. So there's... I would not really say that there are sub teams, ... But it is, it is just kind of a network of people that are available for input for subject matter. ... It's kind of like, it's various subsets of people, and the subsets, the, uh, sets keep changing, the make-up of the sets keeps changing."

Her language seems to emulate the opaque and shifting structure of the configurations she attempts to describe.

Ed's project similarly is a good example of distributed, cross functional, and cross-organizational work involving different organizations and quite a large number of people. Ed was an independent TV producer who had worked for a variety of companies before but had become a self-declared "freelancer". He worked out of his office which was one large room in his flat in a San Francisco hillside building where he lived with his wife and his children and a beautiful view of downtown and the East Bay. The name of his "little shell company", as he referred to it, *Penguin*, was written at the entrance door to his office and reflected his specialization on children's television and animation. When we met him he was involved in producing an animated show for children to be shown both on TV and on the Web. Ed was the overseeing producer for the main client, a children's channel. The project consisted of a fluctuating number of people in multiple organizations in a number of locations all over the US. Ed described the people he needed to be "in touch with on a regular basis":

And the groups that are involved in the making of that are people at [the Kids Channel]. [The Kids Channel] is in LA, and there are several groups inside [the Kids Channel] that need to be in touch with me on a regular basis.

There's the woman who's the head of it. Her name is Emily. She's the head of on-air promotions. And then she has a producer working under her, a guy named

Bill, who has an assistant working for him, named Cora. And then there's the legal department, a guy named Franz who works in the legal department. And then there's a person who's been assigned to take care of the online. His name is Brad. And then there are various people who work with him.

There are these groups: the online group, the legal group and then, out of New York, is a writer named Francesco and another writer he works with. Then, creatively, we are working with a production house, CreativePix, here in San Francisco. And we're also now working with a group called Molto Media that does computer graphics on Potrero Hill. -- *That's a lot already* -- Yeah, it's a lot.

Ed estimated that he worked with at least 50 people on that project. Asked whether there was a sort of a core group within that larger group, he reduced the whole lot down to three:

Not so much. I mean, if there is a core group, it's me and the writer and Emily, our boss. That is kind of the core of the core group."

This example demonstrates that the work-nets of participants and constituencies that makes up projects of this kind are potentially vast and variable. They may be vast because they can bring together a large number of people in different places: lawyers, writers, media developers, secretaries, producers, software developers, and technicians that have to be talked with, kept in the loop, and communicated with, each of them in conversation with additional people.

But work-nets are also variable because depending on the type and stage of the project, the particular task at hand, and the person, the people who have to be informed, coordinated and communicated with during the course of a project, may range widely - in Ed's case from three to 50 and everything in between. Moreover, all of the participants have their own additional work-nets and personal networks. For example, Emily, Ed's "boss", had regular meetings with the board of directors at the channel about that project, while Francesco the writer in New York was affiliated with a TV network there. As a result, it seems fruitless to determine what the size of the group working on this project actually was. Ed used the image that such configurations had certain depths, trying to express the fact that each of the people had their own network behind them that comes into focus when looking closer. Like a fractal figure, the network has not clear borders, it associates further and further, deeper and deeper. No wonder, then, that the term "team" never came up in Ed's story about his project.<sup>8</sup>

---

<sup>8</sup> This may illustrate as well that there is no clear and unambiguous distinction between the larger network of potentials, which we called socio-professional network and the actual working configuration or work-net. At any moment a dormant or latent connection may be drawn into a current work situation or somebody from a current project may join the ranks of

Work under these conditions is always net *work* to some degree. The more distributed, heterogeneous, and technology based these work-nets become, the more skills, practices, and strategies are required to manage these structures, most notably measures of coordinating, stabilizing, standardizing, and translating.<sup>9</sup> What becomes important are activities and practices to coordinate schedules and work activities, organize the flow of information, constantly define roles and functions, stabilize structures, generate common understandings, manage boundaries, standardize processes, names, and objects, bridge different (corporate) cultures and languages, and establish shared contexts. A few examples.

If several people collaborate on the design and production of a web-site or an intranet, for instance, issues of standardization become extremely important, especially if they don't permanently work together, are not collocated, and are even part of different firms. Naming conventions and process standards have to be developed and adhered to in order to make it possible for everybody to find, say, a certain document and its most recent version on the file server or intranet - a process the afore-quoted authors conveniently simplify by saying, "For the first time, teams can virtually collocate all the information they need to work together and put it all in context". (Lipnack 1997, 18) Yet, for our informants, those in firms and those working on their own, the issue of conventions, naming, and standards was a constant struggle, exacerbated by changing work configurations, distance, short business cycles, and differing local practices.

So you know, like- if I need to look at a logo, if I'm somebody on the outside at [Kids Channel] and I need to look at a logo that [CreativePix] did, and [Creative] did seven logos and we need to be clear about how we name those, and then how I reference them and to keep a running log of that because then two days later, [Creative] had done three more logo versions of the stuff that we discussed earlier. And you know, how you name those and how you access those, and how you even file them! It's like a librarian's job. [Jill, co-owner, CreativePix]

---

the larger net of people. Indeed, many of the projects our informants worked in included groups of people that for certain tasks or periods were part of the active net while at other times remained outside or in the background. The shimmering boundaries of work-nets are in fact one of their crucial characteristics.

<sup>9</sup> In his book "Ordering modernity" sociologist John Law (1994) describes activities such as juxtaposing, summarizing, and simplifying as ordering activities, a label which would apply to some of the work activities we describe as well. He insists that there is never order, only "ordering". Similarly, one could say that there is stabilizing, standardizing, and contextualizing but never really anything stable, any fixed standards or permanent contexts.

If it isn't formatted in the right way, the programmer can't use it. (Gary, CEO, MediaMax)

Distributed and cross-organizational projects require good communication and interaction infrastructures, as well as means to provide something like a common vision in the absence of the possibility of constant control and supervision. To achieve, for example, a functioning cooperation among all the different participants in Ed's children's project, a certain technological infrastructure had to be created, a system of exchanging information or work material which ranged from reports and communication by email, telephone, conference calls, drawings by fax, video tapes per Fed Ex, picture files on an intranet, to a lot of traveling to have personal face-to-face meetings. Describing how a number of people in different places came to look at the newest animated sequence so that they could collectively talk about it, the following example illustrates how this collaborative infrastructure is not only technical but has to entail a system of practices:

And so I'll put the computer stuff onto tape, on a VHS tape, make five or six copies, get to the Fed Ex office before they close, and everybody will look at it in the morning and hop on the phone and discuss it at 11 o'clock the next morning, because, you see, 11 o'clock is good because by then it's 2 o'clock New York time. They will have already seen it. They will have come back from lunch, and so they can hop on the phone, and it gives it enough time to get through the mailroom at [Kids Channel in LA], which is usually slow, and finally it gets to somebody's desk and finally they come back from all the ten thousand meetings they have to do, and they get to look at it. Meanwhile, I get a copy or I go down to [CreativePix] and we all have seen it and we all hop on the phone and talk about it.

Another type of net work has to do with defining roles and establishing a functional division of labor. In industries where clear professional identities or clear boundaries between industries or markets seem no longer to exist -- where "everything touches something else" and "all those things are mixed", as David, the co-founder of a commercial and animation production company put it -- projects need to first identify and negotiate who is who and who does what. In a recombinant corporate landscape, a certain structural and functional clarity that seemed to be almost a given in the traditional team model, now has to be rebuilt every time anew. Laura whose struggle to describe the moving "team" structure in her project was presented earlier, answered a question how people knew about other people's functions in such netted work-structures of nearly transient strangers:

We do that mostly through... that's mostly just, almost like a training function. Bringing people together, talking about what are the critical success factors for

this project, how it's going to be organized, what their role is, what their responsibility is. So it's a constant kind of reinforcing sort of thing. It's really a team-building issue. In the end, all these things to a large extent rely on people. And so it's really trying to raise the awareness of the issue.

Raising awareness of other people, their roles, and functions is only one prerequisite for functioning teams, there are many other team building strategies such as keeping them in the loop, having them meet regularly, etc..

Other kinds of net-work issues cannot be solved through structural or organizational approaches. Especially for bridging context and spatial distance, additional skills and considerations are required. Rachel, a production manager in the aforementioned multimedia company MediaMax, explained how she talked to contractors who work from home:

I realize that they are at home in their home setting. I don't call them up and talk business right away. I'll call them up - for example, one of my programmers off site is working on fixing up his house. I'll call him up and say, 'Hey! How's your floor going' or 'your windows' and kind of get into his world. And he'll talk to me and we'll chat about this and that and then I'll get to work stuff. Cause I know, I've worked at home before. I know what it's like when you get this business call and you're in your home setting. It's just kind of sometimes invasive or intrusive, and you need to walk a fine line whereby you have that kind of intermediary language. And I don't think it's a ruse. I think it's just a part of conversation that you're meeting each other somewhere. -- *Interviewer: Just establishing context ...* -- Exactly. The two worlds. And I did that with everybody that's an independent contractor in their own way.

The sensitivity towards different contexts was also exhibited when she talked to clients in distinct organizational cultures, "switching gears" and languages as she spoke with the representative of a bank in a "corporate" way, a woman in a union in a "sisterly" way, and an artist in a game company in an "entertainment-y kind of way".

Traveling entailed as well necessary work for our informants. They needed to maintain contact with their work-nets, remain informed or "plugged in" ("by checking voice mail on a religious basis"), and find their way in new locations, even if it were a second office in a location across the country. For instance, Carl worked in public relations in a large telecommunications company. His main office was on the west coast, but most of the people he worked with were based in the company's headquarters on the east coast. Regularly, he spent a week at headquarters, using as office one of the undedicated workplaces available to visitors like him, so-called "swing spaces". Between meetings, he tried to keep in touch with the people there and in the loop by engendering "serendipitous" planned interactions.

Well, all the public relations people, at least most of them, are headquartered in one area of [the company's main location on the east coast] - the big Mother Ship back there. So in fact the week that I was back there I spent a lot of time either in meetings, or [when] there were times when I was in between meetings or something, I would walk around that area. -- *Interviewer: So you would deliberately do that?* -- Yeah. Stop in a few places; peek in people's doors; that type of thing.

It is not a new insight that collaboration and any kind of work interaction among several people requires effort. Yet, we believe that the complex structures that described joint work situations for our informants did exacerbate the need for such activities. When communicators and collaborators are separated by different contexts, organizational cultures, and locations, and are confronted with changing participation, mediated communication, and various locations, the work to make collaboration successful increases dramatically. We gave only a few examples, but they stand in for how in these dynamic work-nets many things are not a given, but have to be made, generated, created, built, managed, and negotiated: a common language and vision, shared processes, trust, standards, and a technical and social infrastructure. In short, collaboration has to be constructed and reconstructed in an ongoing manner, and teams are constantly in the process of *being* built - but are never built.

### *Boundary-work*

Boundary work -- the second category of work we identified -- refers to the increased need but also increased difficulty to create, maintain, negotiate, and manage boundaries, both at work and between work and *not-work* or *home* or *leisure*. Regarding the latter, we realized that for our informants it took effort to not let the boundary slip, to not let the anytime, anyplace office morph into an "every time-everyplace" office, as futurist Paul Saffo put it (Vogel & Marks 1998). Especially those of our informants who were independent contractors or consultants, who worked from home or traveled frequently had to develop strategies to maintain the boundary between work and home and not let work take over the rest of their lives. Kathy, for instance, the communications consultant, who had an office in her house, set up a strict separation:

I'm not going to bring my office anywhere else. [...] I made the deal with myself that, if I'm going to work out of my house, I can't have everything all over the place. I can't have--little bits of work everywhere would drive me bonkers! So I had decided that it needed to be very separate and I'm very strict about it.

Her rule was not to let work spill over into other parts of her house. The rule was, no work in the living room, except perhaps, she conceded, reading the business section of the newspaper. Although she maintained that it worked for her, she still warned that:

you have to be a real disciplined person in order to work out of your home, because there's so many things you could be doing. [...] The way I structure it, I just have to say okay, these are my work hours, I only go in the office during those times, I close the door on the weekend, or sometimes I do work weekends, but I try to be very structured with it.

Vacations have become the territory of major struggles in interest between being connected to (ones net-) work and keeping away from it. Jill, one of the co-owners of CreativePix, had to learn that in order to have a vacation at all she had to draw boundaries - and not bring her cell phone.

A week in between [two business trips] was supposed to be a vacation but it ended up me being attached to the phone at least part of every day dealing with pseudo emergencies back here.

I swear I'm taking a vacation in August and nobody is calling me! (laughs) - *How will you avoid that?* - Well, I was just thinking, a very small beach house and, just, I have to set aside time with no interruptions. - *So you won't take your telephone?* - There's a telephone there, but no, I'm not taking my cell phone.

Similarly, a consultant for non-profit organizations told us that she didn't take her laptop on business travel anymore, because otherwise her clients expected her to finish work that was talked about in the afternoon by next morning. Not having the option of working in her hotel room was easier than insisting on her evenings as work-free time.

This speaks to the boundary work necessary to preserve the realms of non-work against invasions of work, whether at home, on business trips, or during vacations. But there is also boundary work of the opposite kind: to uphold the boundaries of work against the intrusions of home. A piece of advice given to telecommuters by a seemingly well-intentioned business manager can illustrate this point: to minimize interruptions by one's children when working from home, the home-workers should require their kids, so the manager, to call them on their business phone (in the home-office) instead of just walking in when they wanted to talk to their parents.<sup>10</sup> The strange sound of this seemingly practical remark, stems from the fact that the boundaries formerly provided by physical

---

<sup>10</sup> "While it may seem silly from the outside, it reinforces the separation of the personal and professional time, even when physical separation is minimal", says the manager (reported in Davenport, 1988, 58). This is presented as an example of the training companies are developing to help their employees with boundary issues.

distance and organizational setup are now supposed to be regenerated by the children who are asked to discipline themselves into viewing the home office with their parents in it as a space far away. This is one example of how a setup of remote or virtual work pushes a certain burden onto workers - or their kids.

It is not a new observation that the "electronic cottage" blurs the boundary between work and home (Toffler 1980), but it is worth reminding us that home-workers have to put in extra effort to maintain distinctions that previously were supported by physical location or organizational frame.<sup>11</sup> Some of the people we talked to decided explicitly not to work from home, because they felt they needed the spatial and organizational separation between work and home and either were not willing or felt they may not be able to recreate the necessary boundaries by themselves.

All of the above examples referred mainly to the work of placing and maintaining boundaries. Yet, as sociologist Nippert-Eng demonstrates in her foundational study on home-work boundaries, boundary work encompasses both the placement and the transcendence of boundaries (1996).<sup>12</sup> Since individuals position themselves always somewhere in between the extremes of total integration and total separation of home and work, according to Nippert-Eng, they constantly work both to maintain and transcend these boundaries. Commuting, for example, entails a special kind of boundary work, despite its bad reputation. Like the liminal spaces described by anthropologists, the daily commute in cars or trains seems to help to ease the transition between the world of work and the world of leisure. Asked whether she thinks about work when at home, Rachel, production manager in a small multimedia company, explained her conscious strategy to elongate the commute further.

Uh... yes. Yeah. I try not to, I try to just have a transition period before I go home. Usually when I go home I'll take public transportation and then I'll go home and

---

<sup>11</sup> Since the term "telecommuting" was coined by Nilles during a period of sudden concern with energy and fuel consumption in the wake of the oil crises, there has been steady work on many aspects of telecommuting, including its effect on transportation patterns, community relationships, and, of interest here, the negotiations between home and work. Among the more interesting and broader scholarly work is Huws (1990), more recently there has been a proliferation of survival handbooks and manager guides, as well as journalistic accounts on the intricacies of telecommuting (e.g. Wells 1997).

<sup>12</sup> Nippert-Eng defines boundary work in general as "the never-ending, hands-on, largely visible process through which boundaries are negotiated, placed, maintained, and transformed by individuals over time" (1996, viii). Boundary work regarding the realms of home and work is a special case of that.

I'll either... before I even go in the house and deal with house-stuff, I'll go and water my back yard or walk my dog so that I don't go straight from one space to another space. And then... because if I do go into the home space directly then I bring work home with me. So I kind of have this transitional exfoliation time.

Commuting both serves to maintain and transcend boundaries. If this liminal space is gone because the commute takes only the two seconds of closing one's office door and walking into the living room, it has to be replaced by some other material or mental process of transition.

In general, the current transformations toward more mobility, flexibility, and virtuality tend to blur rather than solidify these boundaries. As a consequence, compensating activities to strengthen, replace, or renegotiate boundaries are increasingly needed. Furthermore, as we tried to show, this increased permeability of the home-work boundary is not a symmetrical one. As home can usually be infused more easily with work than the other way round, boundary work to maintain borders in order to keep in check the threatening colonization of life through work is more wide-spread than the opposite kind.

A second type of boundary work is within the sphere of work. It is about negotiating one's position in the networks; how active, reachable, and available one wants to be at different times, and it especially refers to efforts to make oneself *unavailable*, temporarily absent, to have uninterrupted space - practices and strategies that we call "*islanding*", and that have become increasingly essential.

Islanding can take many forms: a very common strategy we encountered with about half of the people we interviewed and who worked in office environments was to escape the many interruptions of the office world by working from home - permanently as "home-officer" or one or two days per week as telecommuter:

There's just a lot of meetings. I mean, there's--you can't fit 'em in all every day. But when I can work from home, it's amazing, it's just amazing how much work I get done. It's just, uh, heaven! (Jill, content strategy, Internet portal company).

A strategy which in itself can create new boundary problems, as we saw in the previous section.

Consultants are often explicitly hired because of their outside position, a position, however that they need to constantly negotiate and maintain. Kathy for example avoided interruptions by turning off the ringer of her phone for certain

periods during the day. One of the groups she worked with, was not "happy" with these delays and wanted her to be constantly reachable.

So I said well, do I turn my ringer on when I don't want it on, or do I get a pager? And I figured the pager would be easiest. [...] So I am going to be purchasing a pager for this one group so that they can get me whenever they want during business hours.

Between being available without pause and being an efficient consultant, the pager seemed the smaller problem.

Islanding, like retaining work free vacations or evenings, was also achieved through avoiding certain technologies: a manager in an Internet portal company avoided participating in some of the half a dozen parallel communication media at use in the company by refusing to get devices, such as two-way pagers or radio phones.

The strategies for islanding ranged from the subtle to the structured. Sven, a researcher in a telecommunications company admitted that the need to dial-up when at home helped him refraining from checking his email every five minutes. Interestingly, cumbersome technology can turn out to be quite useful in getting precious unconnected and uninterrupted time in that way. And Kathy, the consultant, organized her day into phone periods and dedicated non-phone periods during which she let all her calls go to voice mail. There are even commercial products as institutionalized response to the need for islanding by making available information about how and when people in the public relations business can be reached and, equally important, should not be contacted; a deadline-pressured newspaper journalist may warn potential disturbers to not call in the early afternoon, for example.<sup>13</sup>

Technological, social, and organizational factors contribute to the strong need for islanding. The increase in mobile and communication technologies makes people available and reachable in ways they were not even a few years ago. Yet, it is the shift in social and cultural expectations about return times, speed in response, and availability, that can convert the technical potential into social requirements. It seems that few are exempt from the acceleration of transactions and the rise of urgency in business. Contributing to the scarcity of isolated work time is also the amount of communication and interaction that net working requires. While on the one hand "face-time" is more difficult to get because of geographical distance and hard-to-synchronize schedules, the

---

<sup>13</sup> The product is MediaOnline by MediaMap.

opposite, "face-down" time, bent over the keyboard, appears even harder to achieve.

Islanding is boundary work in that it builds or strengthens borders against interruptions and intrusions from other people. It is the other side of the coin of net-working. Maintaining one's networks and making one's work-nets function stresses the connections, associations and relationships with other people, while islanding is the strategy of splendid isolation - remaining partly disconnected, separate, and unrelated for a few minutes, an afternoon, or a weekend. More generally, boundary work within networks or work-nets is positioning work. It is not just about keeping up boundaries but about carefully negotiating and managing different and partly contradictory needs. While boundary work with regard to the home-work boundary deals with longer term boundaries, this kind of internal boundary work is rather brief and temporary.

In sum, boundary work is about negotiating one's availability in one's networks and work-nets as well as negotiating the moving demarcation lines around work altogether. At times it is about keeping up and maintaining boundaries by replacing old orders (and borders) previously guaranteed through systems of location, time, and organizational setups with new practices and strategies to manage work and leisure. These practices more often have to hold in check the colonizing tendencies of work and, less frequently, the potential distractions of home. Similarly often under conditions of mobile, flexible, and virtual work, boundaries become fluid and have to be renegotiated entirely - thereby changing the meaning of work itself.

### *Technology-work*

The notion of "technology work" points to the observation that technology has become so ubiquitous and essential for work that it is no longer just a tool; rather, it has become a condition in itself and requires increasing amounts of time, effort, and expertise to use it to its potential. Technology work thus comprises the construction and maintenance of technological environments for work activity, communication, and collaboration as well as their informed and meaningful use and appropriation in a social context. The types of work we focused on in this study, knowledge or information-based on the one hand and remote, dispersed, multi-locational, and netted on the other, rely heavily on

information and communication technology. And the more flexible, fluid, multi-party and temporary work configurations become, the more bricoleur activity of fitting together, adjusting, tuning, and protocol establishing is required.

One type of technology work has to do with keeping up with changing technology. By now it is no longer news that it has become a permanent challenge to stay informed about, acquire, set-up, maintain, constantly upgrade and customize the newest and best computers, fastest and cheapest network access, most recent software, and smallest portable and telecommunication devices. An employee of a telecommunications company described, for example, his time paradox with computers: he could do things faster if he learned to use his computer better, but time to learn was limited as well.

I'm sure that many of these things I can be much faster with, like I said about my computer: I'm only going to learn about 10% of it cause I could spend all day here learning to do some other function faster, but that's not my job. Learning to use my computer is not my job. There's only a certain amount of time that I can devote to that and that's been painful enough as we've switched platforms left and right; upgraded several times. (Carl, public relations)

This process of keeping up is hard enough in and for organizations with specialized IT departments, but for contract workers, consultants, and small businesses without outside support, it can resemble a Sysiphean task.

Leroy Inc. was a small but established business in Silicon Valley that offered services such as documentation writing, training, and usability testing to larger software companies. The owner and CEO pointed out how their specific needs in web-based collaborative software tools that help organizing collaboration and differentiated access to their often large documents forced one of their information designers to spend about half of his time constantly searching for these tools. A large time investment for a company that had less than twenty employees - and it remained without success for the time being. As an independent, Ed, the TV producer, didn't have the support that somebody had with a closer affiliation with an organization. Although he worked on a big production project, his tech support person was somebody in the neighborhood who had advertised on telephone poles and set up his ISDN line for him (yet only supported PCs and not his Mac, for example). Thus, he sounded somewhat envious when he described Francesco, the writer in New York, who was "a bit more plugged in" because he was working with a TV network station:

He has a secretary who answers his phone for him and he has fax machines down the hall and, you know, a Fed Ex receipt person who will send and receive Fed Ex packages and put them on his desk. I don't have any of that. My Fed Ex is, I

go up to this place called Mailboxes up on 24<sup>th</sup> Street, just four or five blocks. My fax machine is that fax machine over there on the table, and the way I stay in touch with everybody, as I said, is a lot through email and through conference phone calls.

Without support, without even a secretary, Ed emphasized, he had to improvise permanently and was less organized and less efficient than he would have liked to be.

In addition to dealing with the basic communication infrastructure, there is also the work necessary to overcome the many insufficiencies of current computer technologies generated by incompatibilities and firewalls in inter-organizational communication and collaboration. Although the Internet was recognized as tremendously helpful for dialogue and for data exchange by most of our informants, there still was a tremendous amount of foundational work required to utilize the technology.

You know, these things are all very helpful, but they still rely on a form being created around them that everybody understands, you know, language that everybody understands as you're putting data in. [...] But, you know- it's interesting. It takes a lot of time - seems to right now, anyway - take a lot of time to create that structure. And many times there isn't that time to do it, so it's uhm, tough- (Jill, CreativePix)

Since the lurking discontent, constant struggle, and huge investment of time and energy by individuals regarding computer technology is widely known these examples may suffice.

Instead, we want to focus on another kind of technology work: the efforts to choose among communication and collaboration media and to use them in a "refined way", as one worried CEO of a media company put it. As communication and collaboration with co-workers, colleagues, and co-participants in networks and work-nets gets more and more technologically mediated, selecting between phone, voice mail, email, pagers, instant messaging, between conference calls, video conferences, intranets, chat or "face-to-face" has become an arena of fine-tuned juggling and sophisticated practice. Even choosing between the increasing number of "communication vehicles", as a manager from an internet portal put it, is not a trivial task.

That's the challenge. I mean, the good thing is we have enough communication vehicles. The bad thing is we have a lot of communication vehicles. (Emma, Internet portal)

Informed choices about media in social contexts have to take into consideration many factors: the affordances of the medium, predilections of

sender and recipient, genre-specific expectations, nature of the task, state and history of the project, technical infrastructure, need for documentation or second party awareness, and a certain informational economy. For instance, asynchronous communication technologies such as voice mail or email are more convenient and require less scheduling coordination, but they are also less interactive as phone, conference calls, chat or instant messaging. Information distribution and dissemination works well through email, while problem solving or fine-tuned coordination may often be better in person or through phone calls. In order "to invite some discussion and evaluation of *how* we're going to get something done," Ashley, the production manager of a multimedia company, favored conference calls over email. Some people seemed to find it easier to spontaneously write an email, others preferred to "pick up the phone". And knowing the other's personal preference could be essential for successful business communication. But there were also distinct company cultures. Not surprisingly in a large telecommunications company the phone was the preferred medium, while email was by far the communications medium of choice in the small internet companies we looked at. Similarly, according to a marketing consultant, there is a certain hierarchy in the public relations business in that the choice of the medium had to match the significance of the task: real face-to-face meetings with editors for example are reserved for high level events such as the launch of a major new product line; trying to make physical appointments for minor issues is seen as inappropriate (Nora, marketing consultant). In the beginning of projects, communication that helps getting to know each other and build social relationships and trust were seen as more important than later when detailed coordination issues may be negotiated in email equally well. To summarize these examples of sophisticated media choice, desired degrees of synchronicity, interactivity, urgency, social presence, convenience, and cost have to be - and often are - reconciled when any kind of communication and collaboration medium or environment is being chosen (see also Whittaker et al. in preparation).

Much of net work we discussed earlier as well as what we called islanding, is done through intentional choices and decided use of media and communication technologies. Email, for example, with its ability to "cc" other people can foster group awareness, provide the opportunity to open up a group's information space, and bring closer people like clients, secretaries, or

peripheral group members who are part of the more remote spheres of the work-net.

I find with e-mail and the way I tend to use it a lot, is when I need to have a one-on-one dialog with someone but it would be nice that someone else knows that's going on, I sort of "cc" the information to a third party and sort of keep people in the loop but not force them to participate. (Ashley, MediaMax)

Email's utility of 'keeping people in the loop' was mentioned more than once. For remote workers, consultants, and telecommuters, staying in touch and networking needed the right medium for the right task. Many said that phone use, for instance, could bridge differences in contexts, languages, and (corporate) cultures often better than email. At the same time, phone and even more email could limit "mind space" for certain interactions and exchanges compared to physical meetings and thus were strategies for islanding.

Furthermore, media choice and use not only alleviates and hinders communication and collaboration depending on technical affordances, social norms, and cultural sentiments, it also can send a message about the intentions and expectations of the person who made the choice, e.g. what communication they find desirable. For example, arranging physical appointments can convey commitment or stress the social aspect of a business relationship. Using email for all communication during a project may indicate missing trust, since the participants want to have everything "for the record"; in this case email may start to look "like rockets being sent back and forth, you know, torpedoes." (Rachel, MediaMax) In this sense the medium itself sends a certain message. This message is not unambiguous, however, since heavy email use may also just refer to the distributed and intricate network structure requiring a common record for everybody.

This type of technology work, the efforts, activities and practices that go into the selective, productive, and appropriate use of media, from the acquiring of basic media literacy to its refined use lies at the heart of working successfully together with other people in distributed, fluid and virtual work structures. Without the kind of sophisticated and adjustable usage our informants would not have managed to work the way they did. They could not have properly managed the flow of activity and relationships in work-nets nor negotiate their own forms of presence in them. Although our informants were fairly aware of the growing role of technology in their work worlds and the need to master its potential, they could not always articulate the high level of techno-literacy they

themselves exhibited or rationalize their adroit choices, nor did they have a full appreciation of the ubiquitous and considerable efforts we call technology work.

### *Mediated networks*

So far we have described technology work, boundary work, and net work largely as distinct categories, but in practice they are hardly separable. Boundary work and technology work are often seamlessly integrated into net work. Islanding is often done through technology, and the management of networks and work-nets requires much boundary work. The three categories of work thus can be seen as different aspects of the same thing. Managing one's networks and work-nets including one's own presence and absence in them, with and through technology, is accomplished through the same activities and practices.

Since the work-nets and networks are maintained by, and exist to large degrees through, technological mediation, they are not just socio-professional but *techno-social* in nature. As the term socio-technical has been used in science and technology studies to describe technological systems as seamless webs of social and technical constituencies (see Hughes 1983, Bijker & Law 1992), we want to indicate with 'techno-social' that these obviously social networks are also intricately technological. They are more and more technologically mediated and exist less and less outside of technology. If the social is technically mediated, relationships within these structures cannot be understood, nor lived, without acknowledging their technological base. Managing and using these networks is becoming a question of technological and media literacy as much as of psychological, social, and organizational sensitivity - where a definition of the term literacy has to include the adept use of communication technologies for social and business purposes in cultural contexts.<sup>14</sup>

---

<sup>14</sup> The parallel shouldn't be taken too far, however. The term techno-social should not indicate, in a simple reversal of early social constructivist arguments, that these social networks are technically constructed or get their meaning from technological processes. In both cases, the seamless webs of sociotechnical systems and the technosocial networks in the new economy, the materiality of technology and the meaning-making quality of social processes have to be taken into adequate account. In this emphasis on sense and meaning making, we differ from actor-network-theory (Latour 1992; Law & Callon 1996).

### *The hidden costs of virtualized work*

In the paper thus far, we have presented the findings of our study: the current transformations of work towards more flexible, mobile, and virtual forms entail additional work activities and efforts in at least three interrelated areas, which we identified and described as net work, boundary work, and technology work. We have laid out how much understanding and planning, negotiating and managing, rearranging and juggling was required in order for people to make communication run smoothly when not collocated, to bridge contexts, to deal with absence from the office, to adjust to permanent change, to refrain from working incessantly, to integrate diverse mediated forms of communicating, and to actively take their professional futures in their own hands.

In the rest of the paper we want to demonstrate that what we have been describing is the cost for the transformation to flexible, mobile, and virtual work. More importantly we assert that these additional kinds of work are largely hidden, and "deleted" from accounts of current work, especially from and by what we identified earlier as the discourse of virtuality.

The three types of work are 'extra' efforts in the sense that they are partly *new* or *intensified*, and partly *individualized*. Some of the work we discussed, especially some of the boundary work and technology work, e.g. the choice in media, may be more or less novel, other practices and activities have merely become much more frequent, ubiquitous, and extensive than they used to be.

To be sure, building networks to support one's careers, struggling with new technologies, and negotiating boundaries has to some degree always been part of work. Sales people, for example, have come to epitomize work away from colleagues and their organizations. What is different today, we suggest, is the scale of change and the cumulative effect of several factors combined. While sales people in the past may have known what it meant to do sales work, were prepared for the extra work required, and could make use of the collective wisdom of their communities of practice, many of our informants today became 'sales people' only recently and without it realizing. Moreover, all the other people they work with and do business with seem to become 'sales people' as well. In a world of 'sales' the extra work required by each person may not be entirely new, but it has reached a new level of intensity.

In addition, some of the work we have identified is not just more intense, it is also being individualized. What used to be taken care of by traditional

organizational structures is now increasingly carried by individuals. We presented example of how working at home required workers to maintain boundaries previously warranted by the structures of the workplaces now in their own minds and through their own practices. Other examples described how institutional support for working from home and traveling is often lacking. And, after all, net work in general is almost by definition individual work, because it is about the growing significance of personal techno-socio-professional networks in contrast to institutional and organizational structures.<sup>15</sup>

How costs are transferred onto individuals is perhaps fairly visible in the case of alternative office arrangements such as hoteling or large telecommuting programs, where corporate savings of real-estate costs are being carried more and more by individuals. Davenport argues that "home offices accomplish the cost-savings objective by replacing company real estate with the employees', raising questions of fairness." (1998, 54). While individual workers buy equipment, rearrange their homes to accommodate their home-offices, and give up living space, these costs often do not figure into official calculations used to justify the financial success of such corporate policies. How official accounts neglect other costs became also apparent during a conference presentation by a manager of a large computer company who presented as financial success the company's fairly large telecommuting program in the US for which he signed responsible. When asked whether subsequent IT costs were included in their cost-benefit analysis, the manager had to admit that they were not, nor - and this is the point we are trying to make - were the real expenses their mandatory program generated for their employees. <sup>16</sup>

As those invisible costs by individual workers make possible the savings by organizations that introduce rigorous telecommuting programs, the non-financial and less tangible costs that we have described make possible the shift to virtual, flexible, and mobile work configurations precisely by being pushed onto

---

<sup>15</sup> This is not to say that our informants were passive victims of transformations happening outside their control. Indeed many of our informants chose their situations, preferred to work from home, enjoyed the flexibility and independence of contracting relationship, and loved their job even when it required to spend every second week on the other side of the country. They actively shaped their work life according to their own desires as much as possible. But, as we are going to argue, full awareness of the status and origin of all this extra work is undermined by the discourse of virtual work.

<sup>16</sup> Verbal comment at *alt.office* conference in San Jose, California, August 13-14, 1998.

individuals - and being hidden from official accounts and erased from the discourse of virtuality.

### *Deletion*

This process may be characterized as a process of "deletion" (see Star 1989, Law 1994, Forsythe 1999). As used in science and technology studies, deletion describes a process of rendering invisible certain activities that are essential for the production of scientific facts or technological artifacts but not represented as such. For example, much of the social negotiations are erased from the accounts of scientific discoveries. In fact, the erasure and deletion of the social nature of scientific processes is necessary to portray a scientific fact as fact, as something that exists in nature and outside of the social context in which it was "discovered". In the same way, we argue, the effort and work required of and to a large degree carried out by individuals in the shift to virtual work is deleted.<sup>17</sup> This work to use technology, to manage networks, and to manage one's presence or absence in it, is hidden from public accounts and rendered invisible by the discourse of virtuality.

When we pointed out in the beginning how current images and representations of work stress the way new technological solutions or new organizational forms could achieve higher productivity through flexibility, mobility, or virtuality without much cost, we described a rhetoric that erased the actually occurring costs. Instead we have tried to illuminate what the discourse deletes. Space and time may matter less, we said, but it requires work to make them matter less, and even then, new efforts are needed to balance the boundary shifting effects of the everywhere-everytime office. Technology may help to connect from and to remote places, but once the connection is made, the real work only starts. Technologies also may "enable" "virtual teams", but to make them productive and truly collaborative requires a wide range of laborious strategies, techniques, and social practices. Finally, flexible business relationships may provide more freedom and adjustability, but they also ask for alternative social configurations to provide for the lost security and social integration --

---

<sup>17</sup> The notion of *deletion* goes back to social interactionism. In John Law's words, "interactionists write, inter alia, about the way in which low-status work is deleted by those of higher status." (Law 1994, 99) Our use of the term doesn't require agency with high status, although it is likely that the power to shape a discourse is reflected in status as well.

configurations that themselves demand constant building and managing activities.

Dissecting further the substructure of meanings underlying this discourse, one encounters not only the usual suspects of technological progress, the mantras of heightened productivity and costless transformation. One also finds other utopian promises: the tropes of liberation (from the confines of place and the regimes of time), democratization (through less hierarchy), and self-expression (via enhanced creativity).<sup>18</sup>

Deletion, as has been pointed out in science studies (Star 1989), is not arbitrary; it serves functions and it has consequences. Here, it functions first and foremost to hide how much of the burden of virtualization is pushed onto individuals, and thus allows interested parties to promote the current transformation of work as beneficial to everybody. It also keeps up the techn-utopian belief in the magic of computer technologies. This of course, serves well those who want to legitimate planned changes in the organizational structure or real estate layout of their companies, those who have a stake in technologies on which virtual, flexible, and mobile work rely, or those who made the transformation of work their careers in other ways.<sup>19</sup>

In addition to these ideological functions of deletion, there are immediate consequences. One effect of the erasure of the actual costs of the transformation of work is that business reorganizations and policies as well as technology designs remain uninformed of the actual situation and fail to adequately address the problems of current work. Examples range from telecommuting programs without special training and advice for the participants, over technology design and marketing that conceives and describes products as liberating and efficient but misses to devise support for the translation and standardization work that is necessary to make it actually work, to the general lack of software that supports net work.

Another possible consequence of this deletion may be the fact that the extra work is often not adequately acknowledged by the participants themselves - they do it, and even speak about it, but still did not appreciate that it *is* work or how *much* work it is. Especially, they do not seem to consider it their "real work", as

---

<sup>18</sup> See Iacono (1999) for a interesting discussion of the variety of different discourses participating in the debates about the computerization of work, including counter-discourses.

<sup>19</sup> Yet, discourses do not have to be intentional. Many different constituencies may simultaneously participate in and be affected by the process of deletion.

Carl, a public relations worker, put it. Many of our informants felt that they had not enough time to do their "real work", such as talking to their clients, designing a web site, writing a press release, or a legal brief. We believe that the disregard of the actual scope, status, and significance of techno-boundary-net work, and, facilitated by its discursive deletion, its distinction from "real" work, is likely to put much extra stress on workers. It may keep them from acknowledging their accomplishments, from seeking and getting the support they need and deserve, and ultimately from understanding how their job and skill sets have changed.

But - and this will be the final point in this paper - there is another consequence, and that is for our understanding of what working together may mean under virtual conditions today.

### *The blackboxing of basic concepts - beyond teams*

Both result and prerequisite of this deletion process is an oversimplification of basic concepts such as communication, collaboration, and most of all "team". Although teams are now often "distributed" or "virtual", the basic notion of a team as a well-defined group of people who work together with a common goal and a shared understanding has rarely been problematized in fundamental ways. By drawing attention to the constant work that is going into the stabilization of teams, we suggest in contrast that the notion of a 'stable team' is the ideal and never entirely realized endpoint of a constant effort. What seems the stable starting point for productive work is in fact a quite unstable, constantly changing structure, overlapping with other such structures, and created out of networks by net work. The actual configurations our informants worked in turned out to be multiple, interconnected, dynamically fluctuating netted structures with only partly shared visions and goals.

This does not mean that team-like structures (called "crew", or "team", or "core", or "group") do not exist, but they tend to exist only for certain moments and through ongoing efforts which we defined as stabilization, coordination, team building, contextualization, and so forth, under the category of net work. In a sense, in virtual work, teams exist only virtually. Part of the micro-management of work-nets, as we called it earlier, are strategies to destabilize as well as stabilize structures by alternatively adding new members or making certain participants peripheral for certain activities or time periods. As we tried

to demonstrate through our examples, net work is in fact about the dynamic generation of shape-shifting but temporarily desired stable work-nets.

By rendering invisible or deleting all this net work through the discourse of virtuality, the notion of team can be naturalized and *blackboxed*, i.e. made an unproblematic entity that can be used in the discourse without further questions. This rhetorical effort is not unlike efforts of the blackboxing of scientific facts and technical artifacts that has been identified in the context of science and engineering.<sup>20</sup>

A similar point can be made for other fundamental concepts such as 'communication' and 'collaboration'. They too are in danger of being blackboxed through deletion of all the work that goes into setting the stage for single acts of communication or collaboration under the conditions of "new work" and technologically mediated interactions. Our examples of people bridging contexts and cultures and adeptly selecting media should have demonstrated this point. The deletion of much boundary, technology, and net work by and in the discourse of virtual, flexible, and mobile work hinders here as well an adequate understanding of what communication at work and working together really require. To be sure, communication and collaboration have never been simple processes - nor has 'team' been ever a simple entity - but the additional complexity of current transformations makes blackboxing even more problematic. The changes have also made attempts more urgent to open the black boxes and complexify the very notions of team and collaboration by bringing to the fore, making visible and articulating all the hidden work.<sup>21</sup>

---

<sup>20</sup> The notion of blackboxing is used in science and technology studies to describe the process of bringing closure to the social negotiations and constructions that surround a fact before it is acknowledged as a fact, or an artifact before it is agreed upon as the best solution to a given problem. A blackboxed concept is unproblematic and stable, there is no need to look inside it, in order to further use it (Bijker 1987). This is also why the oversimplification of basic concepts is not just a result of the deletion of the extra work required, but can be also said to be their prerequisite: a simple notion of team helps to further overlook the necessary work to make it a team.

<sup>21</sup> This is true although we agree with Bishop's (1999) argument that articulating or making visible invisible work is not always useful. She maintains that making explicit certain social and informal aspects of work may open the possibility of integrating them into the instrumental aspect of work. Although we share her concern, we think the danger of having additional costs erased exceeds the danger of making them visible in the specific aspects of work we are concerned with here. In addition, in difference to Bishop, we do not think that the distinction between social and contractual can be easily mapped onto the distinction visible-invisible.

In this paper, we showed that people such as our informants in a "world beyond the stable state" (Horgen et.al. 1999) live and work in networked structures that are an increasingly important part of their work environment and organize their relationships to others. In addition, we tried to draw attention to what a certain discourse of virtual work tends to render invisible: the additional work that is necessary to make the virtual forms of work viable. By shedding light on the deletion of this extra work, we intended to reveal how the discourse of virtuality, mobility, and flexibility promotes the shift to virtual by hiding how the costs of this transformation are being individualized, underpins a techno-utopian celebration of technology, and hinders the self-understanding of participants in the new economy. Recognizing the deletion of this extra work and making it visible again, may help those who work in those new jobs to improve their own complex life and work situations. It may also help us to understand better what working together in networked worlds is about, including what teams and collaboration may mean when organizational structures, geographical location and technological modes of interaction become more and more fluid. Finally, opening these black boxes may put limits on old techno-utopian views that promise gain while hiding the pain.

### *Acknowledgments*

We are indebted to JoAnne Yates and Ernst Schraube for comments on earlier drafts of this paper.

### *Bibliography*

- Apgar, Mahlon. 1998. The alternative workplace: changing where and how people work. *Harvard Business Review*, May-June 98, 121-136.
- Bijker, Wiebe & John Law. 1992. *Shaping technology, building society*. Cambridge, Mass.: MIT Press.
- Bijker, Wiebe, Thomas Hughes & Trevor Pinch. 1987. *The social construction of technological systems*. Cambridge, Mass.: MIT Press.

---

Technology work, some boundary work, and aspects of net work are invisible although they would presumably fall in the category of contractual or instrumental work.

- Bishop, Libby. 1999. Visible and Invisible Work: The Emerging Post-Industrial Employment Relation. *Computer-supported Cooperative Work*, 8, 1-2. Special issue, Nardi, B. and Engeström, Y., guest eds. pp. 115-126.
- Davenport, H. Thomas & Keri Pearlson. 1998. Two cheers for the virtual office. *Sloan Management Review*. Summer 1998. p. 51-65.
- Edwards, Paul. 1996. *The closed world. Computers and the politics of discourse in cold war America*. Cambridge, Mass.: MIT Press.
- Engeström, Yrjö., Engeström, R. and Vähäaho, T. 1999. "When the Center Doesn't Hold: The Importance of Knotworking." In S. Chaiklin, M. Hedegaard, and U. Jensen (eds.), *Activity theory and social practice: Cultural-historical approaches*. Aarhus, Denmark: Aarhus University Press, 1999
- Forsythe, Diane. 1999. 'It's just a matter of common sense': Ethnography as invisible work. *Computer-supported Cooperative Work*. Volume 8 No. 1-2 1999. B. Nardi and Y. Engeström, eds.
- Hayles, Katherine. 1999. *How we became posthuman*. Chicago: University of Chicago Press.
- Horgen, Turid, Michael Joroff, William Porter & Donald Schön. 1999. Excellence by design. Transforming workplace and work practice. New York: Wiley.
- Hughes, Thomas. 1983. *Networks of Power*. Baltimore, MD: John Hopkins Univ. Press.
- Huws, Ursula, Werner Korte & Simon Robinson. 1990. *Telework: Towards the Elusive Office*. Chichester, England; New York: Wiley.
- Iacono, Suzanne & Rob Kling. 1998. "Computerization movements: the rise of the internet and distant forms of work." In J. Yates & J. Van Maanen, eds., *Information Technology and organizational transformation: history, rhetoric, and practice*. [in press] Sage Publications.
- Illingworth, Montieth. 1994. "Virtual Managers." *Information Week*, June 13, 1994. pp. 42-58.
- Lave, Jean & Etienne Wenger . 1991. *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.
- Law, John & Michel Callon. 1992. The life and death of an aircraft. In Bijker, W. and Law, J., eds. *Shaping technology/ building society: studies in sociotechnical change*, Cambridge, Mass.: MIT Press.
- Law, John. 1994. *Organizing modernity*. Oxford, UK: Blackwell.
- Latour, Bruno. 1992. Where are the missing masses. The sociology of a few mundane artifacts. In W. Bijker & J. Law, eds., *Shaping technology/ building society*. Cambridge, Mass.: MIT Press.
- Lipnack, Jessica & Jeffrey Stamps. 1997. *Virtual teams. Reaching across space, time, and organizations with technology*. New York: John Wiley & Sons.

- Mitchell, William. 1995. *City of Bits. Space, place, and the Infobahn*. Cambridge, MA: MIT Press.
- Nardi, Bonnie, Steve Whittaker & Heinrich Schwarz. 1999. "A Networker's Work is Never Done: Joint Work in Intensional Networks." [Submitted to CSCW.]
- Nippert-Eng, Christena. 1995. *Home and work: negotiating boundaries through everyday life*. Chicago; London: Univ.. of Chicago.
- Østerlund, Carsten. 1996. *Learning Across Contexts: A field study of salespeople's learning at work*. Skriftserie for Psykologisk Institut. Vol.21 (1). Aarhus: Aarhus University, Psykologisk Institut.
- Pink, Daniel. 1997. Free agent nation. *FastCompany*, December 97. [www.fastcompany.com/online/12/freeagent.html]
- Sennett, Richard. 1998. The corrosion of character. The personal consequences of work in the new capitalism. New York, London: Norton & Company.
- Star, Leigh. 1989. *Regions of the mind: brain research and the quest for scientific certainty*. Stanford, CA; Stanford University Press.
- Toffler, Alvin. 1980. *The third wave*. New York: William Morrow.
- Vogel, Jennifer & Robin Marks. 1998. "Time bandits. who work sneaks away with our personal time." *Workingstiff*. PBS-online. (online: www.pbs.org/weblab/workingstiff/features/time\_bandits5.html)
- Wellman, Barry & Milena Gulia. 1998. "Virtual communities as communities: net surfers don't ride alone." In Smith, Marc and Peter Kollock, *Communities in Cyberspace*. London, New York: Routledge.
- Wells, Susan. 1997. "For stay-home workers, speed bumps on the telecommute. " *CyberTimes*, August 17, 1997 (online: www.nytimes.com/library/cyber/week/081797telecommute.html, downloaded August 17, 1997)
- Wenger, Etienne. 1998. *Communities of Practice*. Cambridge: Cambridge University Press.
- Whittaker, Steve, Bonnie Nardi and Heinrich Schwarz. 1999. "Revisiting the issue of media choice." [In preparation]