

# LEARNING IN PROJECTS, REMEMBERING IN NETWORKS? COMMUNALITY, SOCIALITY, AND CONNECTIVITY IN PROJECT ECOLOGIES



Gernot Grabher

*University of Bonn, Germany*

## Abstract

This paper seeks to contrast two opposing logics of project-based learning. Accumulation and modularization of knowledge denote the key imperatives of a learning logic that is exemplified by the software ecology in Munich. Learning is geared towards moving from 'one-off' to repeatable solutions. This cumulative logic is juxtaposed with a discontinuous learning regime that is driven by the maxims of originality and creativity. 'Learning by switching' here signifies the emblematic knowledge practice that is exemplified by the London advertising ecology. The paper explores these learning modes by subsequently exploring processes of learning and forgetting within and between the core team, the firm, and the epistemic community tied together for the completion of a specific project. In addition, the

paper also directs attention to more diffuse learning processes in an awareness space that extends beyond and beneath the actual production ties. Instead of mapping the awareness space along a simplistic scalar nesting of network density and knowledge types (reduced to the notorious global vs local dichotomy), the paper proposes a differentiation that primarily involves different social and communicative logics. Whereas *communality* signifies lasting and intense ties, *sociality* signifies intense and yet ephemeral relations and *connectivity* indicates transient and weak networks.

KEY WORDS ★ advertising ★ learning ★ networks  
★ project ecologies ★ software

## Project ecologies: knowledge production at the point of application

Knowledge, it seems, has become magic. The view of knowledge as the most powerful engine of economic progress and competitive advantage is practically 'the historical a priori of the age' (Scarborough, 2001: 204; see also Lindkvist, 2003: 2). A polyphony of voices from different disciplines has grown to reiterate that our economy is shifting from primary and secondary production to an increasingly knowledge-intensive service economy, pointedly dubbed the quaternary sector.

By moving away from this sectoral understanding of economic and societal transformation, Gibbons et al. (1994) stroke a different epistemological chord by focusing instead on the *mode* of knowledge production. The current transformation, from their point of view, appears as an increasing shift of the locus of knowledge

production from the traditional (science-pushed) institutional framework to knowledge production in the *context of its application*. Each particular context of application implies its particular set of theories, analytical strategies and learning practices which cannot easily be located onto the established disciplinary map. Trans-disciplinarity, heterogeneity and transience are quintessential organizational features associated with this mode of knowledge production (Gibbons et al., 1994: 6): '[P]eople come together in temporary work teams and networks which dissolve when a problem is solved or redefined. Members may then reassemble in different groups involving different people, often in different loci, around different problems.' Welcome to the ephemeral world of projects.

Although this scenario shares some of the prophetic verve that echoes through the current heated debate on the different (semantic) variants of knowledge-based capitalism, projects indeed appear

as an emblematic form of this mode of knowledge production (see also Boltanski and Chiapello, 1999). Projects constitute a temporary organizational arena in which knowledge is combined from a variety of sources to accomplish a specific task (for the paradigmatic definitions, see Gaddis, 1959: 89; Goodman and Goodman, 1976: 89). The claim here is *not*, of course, that 'temporary systems' have just recently been added to the spectrum of organizational forms (Lundin and Söderholm, 1995). Projects, in fact, are long-established routines in industries organized around 'one-off' ventures such as architecture, construction, engineering, ship building or movie production (see, for example, Winch, 1986; Faulkner and Anderson, 1987; Lundin and Midler, 1998). More recently, though, 'projectification' (Midler, 1995) seems to have taken hold in a range of traditional industries in which it has not previously been part of the canonical repertoire of organizational forms such as automobiles or chemicals (see, for example, Ekstedt et al., 1999; Lundin and Hartman, 2000; Bragd, 2003); moreover, new industries such as software, new media or business consulting *are* genuine project industries (see, for example, Perlow, 1999; Grabher, 2002c; Siedersleben, 2003).

The practice of project-based organizing is captured only insufficiently in the notion of the temporary system with 'institutionalised termination' (Lundin and Söderholm, 1995). Projects, in fact, hinge on a dense fabric of lasting ties and networks that provide key resources of expertise, reputation and legitimization (see Ekstedt et al., 1999; Sydow and Windeler, 1999; Gann and Salter, 2000; Grabher, 2002a; 2002b; Sydow and Staber, 2002; DeFillippi et al., 2003; Engwall, 2003; Scarbrough et al., 2003). The practice of temporary and episodic collaboration, phrased differently, relies on an intricate *project ecology* (Grabher, 2002b; 2003) of enduring ties and institutions. The relationship between 'project' and 'project ecology', however, is not equivalent with the interrelation between 'organization' and 'context'. In a similar way to the image of the Greek vase (as in trivial perception tests in psychology), foreground and background cannot be distinguished in an unequivocal fashion but rather switch back and forth.

The notion of the project ecology, in other words, signifies not just a passive institutional environment but denotes the networks and

institutions that constitute integral ingredients in the practice of temporary collaboration (see also Scarbrough et al., 2003). The intricate interdependencies between temporary projects and permanent ties and institutions, moreover, can hardly be conceived in terms of neat complementarities or mutual support (on 'critical' project management, see for example, Bresnen, 2003). Actors, networks and institutions within project ecologies rather adhere to diverse loyalties and logics that, symptomatically, beget conflicts of organizational imperatives and cultures and professional identities (see Alvesson, 2000; Swart et al., 2003). Project ecologies, in other words, do not only represent a particular ensemble of organizations and institutions temporarily tied together for the completion of a particular task. Moreover, the notion of the project ecology denotes also an ecology of organizational logics and individual identities, values and loyalties.

### The challenge of project ecologies

The inherently complex and ambiguous nature of project ecologies thus incites a problematization of some of the concepts and assumptions that, implicitly at least, seem to underpin current reasoning in economic geography. The paper aims to embrace the multiplicity (not to say hybridity) of logics and identities and thus seeks to dehomogenize conceptions of firms and networks in particular, and to challenge assumptions on spatial scales and learning. In doing so, the paper wishes to follow the pleas for a decidedly non-essentialist perspective of geographic inquiry (Lee, 2002: 340–1; Ettliger, 2003; see also Massey, 1997; Whatmore, 1997; Dicken et al., 2001; Amin and Cohendet, 2003). Such relational thinking recognizes the multiplexity of logics and perseveres that identities are not pre-given essentials but constantly reshaped through a variety of internal and external influences.

### Firms

In economic geographic analysis, the firm still enjoys an ontological and epistemological privilege.

Despite the invocation of districts, milieux, clusters and other meso-level socio-spatial aggregations, the firm epitomizes the basic analytical building block. The integrity of this corner stone of inquiry remains largely untouched, the firm being rather universally invoked as an atomic crystallization of commercial agency, universalized as a 'stylised fact' (Maskell, 2001; Taylor and Asheim, 2001). Resonating with classical accounts in economics and business studies (for example, Chandler, 1990), the firm, in short, remains unproblematized as a unitary and coherent actor (see also Schoenberger, 1997).

Practices of knowledge creation, distribution and sedimentation in project ecologies perforate and entangle organizational boundaries in multiple ways. In the course of projects, the actual sites of learning cyclically shift between various organizations involved. Temporary collaboration thus undercuts the coherence and integrity of the firm as the basic analytical building block. The radical single-task focus together with the temporal limitation of projects privileges a *situative pragmatism* that blurs organizational boundaries within firms. Knowledge, in principle at least, is valued according to its usefulness to achieve the project task rather than to the authority of its departmental origin. Between firms, organizational boundaries of projects operating across different firms, in fact, are often more decisive as boundaries of the respective firms. The task orientation of knowledge-integration and production, as the paper seeks to elucidate, is reflected in the location of projects, literally, at the point of application: projects are placed *within* client-organizations or *at* the boundaries of cooperating organizations to afford a readjustment and collaborative accomplishment of the project goal in situ (Gann and Salter, 2000: 957); conversely, projects are located off-site to maximize cultural and cognitive distance from the organizational 'home base' by means of geographical isolation to allow projects to unfold task-specific approaches (see, for example, Schoenberger, 1999: 216; Zeller, 2002; see also Bengtsson and Söderholm, 2002).

### Networks

The meso-level in economic geographic inquiry is typically conceived as a set of firms (and

'institutions') variably tied together through networks. Despite the prolific categorization of different network patterns in economic sociology (for overviews, see Powell, 1990; Smith-Doerr and Powell, 2003; Grabher and Powell, 2004), networks in economic geography have remained somewhat under-theorized (see Ettliger, 2003: 160–1). Elaborations of networks generally tend to stick with Granovetter's (1973; 1974) paradigmatic distinction between 'weak' and 'strong' ties – if networks are explicitly differentiated at all. Perhaps apart from productive explorations of actor-network theory that acknowledge the multidimensionality of actors and the multiplicity of network logics (see, for example, Thrift, 1996; 1997; Whatmore, 1997; Murdoch, 1999; Bingham and Thrift, 2000; see also Dicken et al., 2001), economic geographic reasoning on networks remains largely focused at the inter-organizational level. Thereby different social logics of networks of individual actors, groups and organizations are either systematically ignored or lower-level networks are unproblematically subsumed under higher-level networks; inter-personal trust, for instance, is confounded with inter-organizational trust: 'the ecological fallacy' (Ettliger, 2003: 156).

Project-based organizing involves a multiplicity of organizational and personal networks. *Networking*, in fact, signifies the emblematic mantra of project ecologies (Wittel, 2001: 63; see also Sennett, 1998). Personal networks symptomatically efface the distinction between private and business (Ekinsmyth, 2002: 234; Heydebrand and Mirón, 2002: 1967), between the communicative logic in the 'life world' and the strategic rationality in the 'system world' (Habermas, 1981). In the fluid and transient world of projects, they fulfil multiple roles; they provide arenas of professional socialization and enculturation (see, for example, Brown and Duguid, 1996a: 68–70); open up access to and careers in project labour markets (see, for example, Faulkner and Anderson, 1987; Jones, 1996; DeFillippi and Arthur, 1998; Swart et al., 2003; Thompson and Heron, 2003); and, more generally, rather than as 'pipes' function as 'prisms' (Podolny, 2001) through which the reputations of potential clients, collaborators and suppliers are inferred from their ties with third project partners (Sydow and Staber, 2002; see also Uzzi and Gillespie, 2002 on 'network transitivity'). These networks involve a variety of

social and communicative logics, different time scales, and various modes of interaction. By exposing overlaps, conflicts and tensions between diverse networking practices, the paper seeks to move beyond somewhat schematic assumptions on the complementarity between 'weak' and 'strong ties'.

### *Scales*

Economic geographic attempts to map the strong/weak-tie dichotomy onto spatial scales regularly result in an ascription of strong ties and social coherence to the local level, while sparse networks are instead associated with the non-local realm (see Ettliger, 2003: 160). This socio-spatial duality explicitly or implicitly underpins the elementary anatomy of the 'territorial innovation models' (Lagendijk, 2001) variously discussed as industrial districts, innovative milieux, clusters or learning regions that are perceived as spatial manifestations of strong ties, linked to the global level through weak connections. This scalar nesting of social relations also provides the template for the geography of knowledge creation and transfer. Particularly in the learning-region debate, dense local patterns of local interaction (reinforced through trust, social familiarity, institutional coherence and sense of local belonging) are read as the vital economic assets for 'tacit' knowledge exchange, while the sparse global networks are conceived as the pipes that convey 'codified' knowledge (see, for example, Lawson and Lorenz, 1999).

More recently, this makeshift translation of the local/strong vs global/weak-tie dichotomy into a local/tacit vs global/explicit knowledge-duality, reified in the ceaseless piling up of case-studies on 'islands of innovation' (Amin and Cohendet, 2003: 144) provoked severe objections that deny a *causality* between spatial scale and density of ties (see, for example, Harris, 1998; Allen, 2000; Oinas, 2000; Ettliger, 2003: 161; Gertler, 2003: 84–6). Profound dissent above all crystallized around implications of this geography of scalar nesting on knowledge creation and transfer.

By taking on the critique on the 'self-evident truths' of the learning debate, the analysis of project

ecologies eschews any simplistic scalar nesting of network density and knowledge types. Rather it is sensitive to 'distanciated' ties that do not adhere to a spatial metric (Allen, 2000: 28):

The translation of ideas and practices, as opposed to their transmission, are likely to involve people moving to and through 'local' contexts, to which they bring their own blend of tacit and codified knowledges, ways of doing and ways of judging things. There is no one spatial template through which associational understanding or active comprehension takes place. Rather, knowledge translation involves mobile, distanciated forms of information as much as it does proximate relationships.

The paper thus seeks to follow the proposition for thinking about knowledge spaces *topologically* (Amin and Cohendet, 2003: 154):

... where the folds and undulations of lines drawn as contours bring into close proximity sites that might appear distant and unconnected on a linear plane, and which allow the possibility of no relational links between co-located sites ... thus allowing an understanding of individual sites as a node of multiple knowledge connections of varying intensity and spatial distance, as a place of trans-scalar and non-linear connections, and as a relay point of circulating knowledges that cannot be territorially attributed with any measure of certainty or fixity.

### *Learning*

Against the fixation with learning in and through dense local networks, a persistent stream of accounts insists on the role of sparse networks and indirect ties at the local level (see, for example Storper, 1997; Oinas, 2000; Malmberg and Maskell, 2002; Grabher, 2002b; see also Burt, 1992). Nevertheless, the more recent turn to the ideas of learning in and through 'communities' (see, for example, Amin and Cohendet, 2003; Gertler, 2003) that imply a strong sense of coherence, familiarity and stability might yet again privilege (although unintendedly) the long term over the ephemeral, or the intended over the accidental and serendipitous. The paper seeks to follow on from the accounts that insist on the crucial role of sparse and indirect ties for learning processes and, in a sense, radicalize this perspective.

More specifically, the paper contrasts two project ecologies which are driven by opposing logics of creating and exploiting knowledge. The key imperatives in the first ecology are *accumulation* and *modularization* of knowledge. Knowledge practices in this ecology are rooted in the fundamental association between learning and repetition: repeated cycles of interaction within the organization and between the organization and the environment form a central base of learning (see also Hedberg and Wolff, 2001). Project organizing in this ecology is geared towards moving from the singular one-off venture to repeatable solutions (see also Davies and Brady, 2000; Brady and Davies, 2003). The cumulative logic of this ecology will be exemplified with software production in Munich that has evolved as a pre-eminent (continental) European cluster in the production of business software (enterprise resource planning, customer relationship management, Internet-related business tools, software engineering tools and document management) (Lehrer, 2000: 591; Tamasy and Sternberg, 2000; Bain & Company, 2001; Casper and Glimstedt, 2001; Casper and Whitley, 2002).

The logic of accumulation and continuity in this cluster will be juxtaposed with an ecology that is organized around the imperatives of *originality* and *rupture*. Although, of course, learning by repetition also plays an important role in this ecology, 'learning by switching ties' both within and across organizations (see Dornisch, 2002) provides the emblematic knowledge practice in this ecology. Whereas the first ecology economizes on the benefits of recurring ties, the latter thrives on reconfiguring relationships. The overarching demand for originality minimizes the scope for repeatable solutions. Convention defying is encouraged, as a convention (Nov and Jones, 2003: 9). The London advertising cluster epitomizes the workings of such a one-off project ecology. London during the late 1980s had emancipated itself from the hegemonic US American industry through a new style of organizing production which made London a prime cluster in creative advertising (Lash and Urry, 1994: 138–42; Grabher, 2001; 2002b).

By way of contrast, the paper subsequently unfolds not only an ecology of organizations, networks and communities but also an ecology of social and communicative logics, organizational identities and professional ethos. Both project

ecologies intricately interweave two social layers. The first layer comprises the *core team*, the *firm* and the *epistemic community*, and is primarily concerned with more deliberate knowledge creation focused on the particular project task; in the second layer of the *awareness space* which evolves through various networking practices, learning is more accidental and less centred on the specific project. In elucidating the interrelations within and between these layers the paper seeks to avoid the functionalist perspective inherent in the normative project management literature (see Hodgson, 2002). Instead of portraying the interdependencies between the constitutive realms of the ecologies in terms of neat complementarities, the discussion will also explore tensions, conflicts and paradoxes.<sup>1</sup>

### The core team

Abstracting from the idiosyncracies of the production process, projects both in the London advertising and the Munich software ecologies are evolving around a 'core team' (see also DeFillippi and Arthur, 1998; Dubé, 1998). Each of the team members not only contributes a different set of skills to the project but also embodies a specific professional ethos and project logic. The practice of project organizing involves an ongoing recombination of these skills within project parameters and in both clusters shares some generic features.

The *service logic* of solving a specific problem of the client is, or at least ought to be, the prime logic of a project. This client-specific task, regardless of whether this involves the improvement of the billing system or the promotion of a product relaunch, marks the point of departure of the project. The latter has to be taken literally since in the course of the project, symptomatically, problems get redefined and tasks renegotiated. This 'scope creep' (Jurison, 1999: 33; Lannes, 2003: 337; see also Girard and Stark, 2002: 1940) has to be balanced against the *management logic* of the project which aims at keeping the project within key parameters such as time and budget. The fragile balance between the service logic (of solving the client's business problem) and the management logic (of keeping the project on track) in a sense provides the

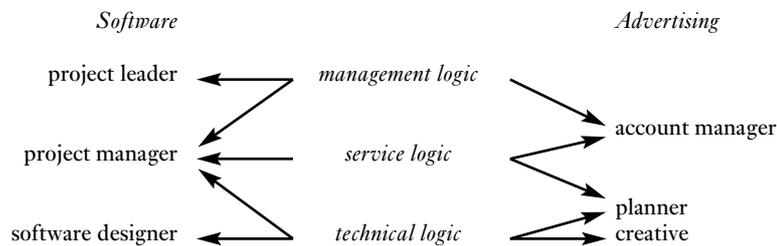


Figure 1 Project roles and occupations

organizational coordinates within which the logic of the *technical expertise* can unfold.

These generic imperatives of project organizing, of course, are embodied in and balanced by different trade-specific professional profiles and occupations (see Figure 1; on software, see Beer, 2003: 31; Scheidle and Taubner, 2003: 7–8; on advertising, see Grabher, 2002b: 248; Nov and Jones, 2003). Each professional profile epitomizes a specific work ethos which implies a certain ‘cognitive distance’ between these professions (see Nooteboom, 2000). Meaningful interaction and fruitful collaboration across cognitive distance is, of course, possible as long as the participants can make sense of each other’s perspectives. In both project ecologies, however, cognitive distance is enacted in fundamentally different ways (on enactment, see Weick, 1995). Whereas the interactions and practices of the core team in the software ecology are geared towards *reducing* this cognitive distance, project organizing in advertising is aimed at reproducing and temporarily *bridging* cognitive distance.

The organizational repertoire to reduce cognitive distance in the software ecology comprises a range of organizational practices and conventions. First, professionals in the course of their careers (sometimes even in the course of a project) switch roles. ‘There are no clear-cut categories of software workers, such as designers, coders, and testers. Designations do not provide job descriptions in the organizational structure . . . job description is ambiguous’ (Ilvarasan and Sharma, 2003: 3). The practice of switching roles is also facilitated by non-discriminating training: typically, candidates with graduate degrees in engineering and technology (in a broad range of disciplines) or postgraduate degrees in informatics, mathematics and statistics are selected by firms for a broad array of jobs and

roles. Similarly, further training and learning within the firm are practically non-discriminating between the various roles. Consequently, professional identities in the software ecology overlap and interpenetrate each other (Solingen et al., 2000: 969).

Second, the composition of core teams characteristically remains stable over several project cycles. Collaboration within the team, over time, thus evolves from an interaction between professional roles to relationships between individuals. Collaboration in the project, generally, seems more strongly moulded by the service-logic of *joint* problem solving than by the particular professional identities. The collaborative ethos that harshly clashes with the cliché of the red-eyed, antisocial coder hidden in a silent cubicle is, quite literally, taken to its extreme by the new approach of ‘extreme programming’ (XP). The ‘12 commandments of XP’ (Baer, 2003: 124–7; Lannes, 2003: 329) demand among other things, meetings with ‘coders, managers, and the customer each week to schedule the next phase’ and insist upon writing ‘all code with two programmers at one machine’.

In the advertising ecology, by contrast, professional identities crystallize into ‘creeds’ whose distinctiveness is reiterated through organizational practice and professional styles (Bilton and Leary, 2002: 56–7; Grabher, 2002b: 248; see also Nov and Jones, 2003). Professionals hardly change roles within the core team (if they change role it is rather by switching from the agency to the client side of the business; see also Blyler and Coff, 2003: 681). Although professionals are recruited from a broad range of educational and biographical backgrounds, further training appears more discriminating between different roles and occupations since it is provided by professional associations (like the Account Planning Group) rather than by individual

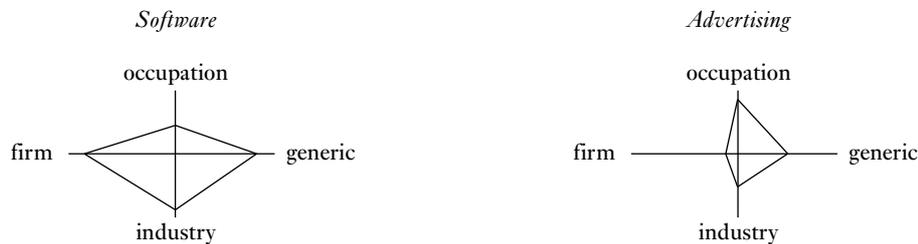


Figure 2 Knowledge formation

Note: Inspired by Scott Snell's intervention at the Academy of Management Meeting, Seattle, 2003.

agencies. More generally, the occupation-centred knowledge accumulation at the individual level in the advertising ecology thus contrasts with a more firm- and industry-oriented knowledge formation in the software ecology (see Figure 2). The comparatively sharp crystallization of activities into professional profiles paradoxically provides the context for fluid practices of productive improvisation since it affords (on the idea of 'affordance', see Gaver, 1996) structuring and restructuring on a moment-to-moment basis (see Bigley and Roberts, 2001: 1282).

Moreover, the personal composition of teams is deliberately altered from time to time to trigger novel and unexpected confrontations of different perspectives; in other words, to maintain cognitive distance. Since interactions within the team are, comparatively speaking, more strongly shaped by professional identities and roles than by individual identities and the project aims, the drift towards a hegemonic perspective is kept in bounds. In this sense, the overarching imperative of freshness (see, for example, Wells et al., 1998: 381) conflicts with normative project management that demands the sacrifice of professional identities for the project goal. The creative success of projects thus, paradoxically, entails a deliberate violation of key principles of project management.

## The firm

### *Economies of repetition*

In both ecologies, firms experiment with, develop and adopt routines that are aimed at enhancing and

accumulating 'project capabilities' (Davies and Brady, 2000; Brady and Davies, 2003; see also Prencipe and Tell, 2001; Scarbrough et al., 2003). On a more tactical level, firms seek to transfer knowledge and experience gained in a particular project to subsequent and related bids and ventures. This type of *project-to-project* learning ranges from rather unsystematic and ad hoc transfer of 'front-line' knowledge to other projects to more routinized practices such as meetings, documentation, and 'knowledge brokers' (Hargadon, 1998). On a more strategic level, firms in both ecologies also seek to transfer and sediment knowledge through *project-to-business* learning. These attempts resemble efforts to increase organizational reflexivity by complementing 'single-loop learning' (Argyris and Schön, 1978) around individual projects with 'double-loop learning' related to processes, routines and practices more generally. The shift from project-to-project to project-to-business learning also marks the move from the *project* to the *account* and, in other words, from the one-off to the client *relation*.

In both ecologies firm-specific best practice is codified in *tools* which provide menus for risk assessment, costing, project-design, scheduling and contractual agreements.<sup>2</sup> Moreover, firms aim at reinforcing and extending the reach of codified tools with (less codified) *culture*. While tools represent a kind of 'blackboard memory'<sup>3</sup> (Lindkvist, 2003: 16), culture embodies a distributed 'network memory' (see also Mintzberg, 1979; Girard and Stark, 2002: 1934–6). Corporate culture in both trades is coloured by idiosyncratic personal constellations, though less visible around the founders in the software ecology but much more palpable in the advertising ecology around the 'stars' and their particular styles.<sup>4</sup> Whereas cultures in the software

environment are moulded by the culture of client industries (software providers of media firms, for example, organize differently than suppliers to engineering companies), the cultures in advertising reflect agency-specific priorities of different professions and their respective ethos (for example, 'emotional' Ogilvy & Mather vs 'scientific' J Walter Thompson). Finally, *stories* about both, the firm's own identity-forming 'historical' projects as well as seminal external success (or flop) stories shape project practices since their circulation is driven by a certain 'moral' (Lampel and Jha, 2003: 9). This moral often translates into prescriptions or principles of project organizing.

### *Economies of recombination*

While in both ecologies project-to-project and project-to-business learning allow firms to reap 'economies of repetition' (Davies and Brady, 2000), only the software ecology benefits from economies of recombination. These economies emanate from the ability to balance the contradictory demands of offering a problem-specific solution to the client and yet, at the same time, to reuse and sediment project knowledge into 'modules' that can be recombined in subsequent or related projects. Modules epitomize the proverbial 'black box', a component that produces a particular output from a certain input while the internal functioning remains largely irrelevant (see, for example, Brusoni and Prencipe, 2001). 'Even service-oriented producers of customized software have an enormous incentive to specialize on a particular kind of customer application that will enable them to reproduce their previously accumulated know-how, algorithms, and even sections of their computer code' (Lehrer, 2000: 594; Stützle, 2003).

Economies of recombination, phrased differently, accrue from *not* offering one-off solutions in the strict sense of the word. On an ad hoc project-to-project level, they flow from bricolage, that is the creation of novel combinations of familiar elements and by-products from previous projects. Such tinkering involves processes that range from serendipity to imitation and the painstaking efforts of trial and error (see also Heydebrand and Mirón, 2002: 1962–5). On a more

strategic level, firms realize economies of recombination by engaging in a process of moving from first-of-its-kind projects to the execution of portfolios of related projects (see also Davies and Brady, 2000: 952). This move widens the scope for reuse in the sense of increasing the 'utility' (by enhancing intelligibility, availability and ease of modification) and/or 'variability' of code (by boosting adaptability and portability to different application contexts) (Stützle, 2003: 191–4).

In the Munich ecology, organizational routines and processes to systematically reuse components are basically confined to a 'library model' (in which centralized libraries of components are managed by reuse specialists; see Fichman and Kemerer, 2001). Basically only large corporations offer their repository in a, so to speak, crystallized version of a *product*, that is a standardized software program. However, even for firms which specialize in products (that is, which embark on the business route of shifting 'boxes'), projects remain of vital importance. Projects provide crucial learning opportunities to refine products (i.e. simplify them for the user) or to broaden the domain of their applicability (see Fichman and Kemerer, 2001). Projects, in other words, are the R&D labs of firms which specialize in products (see also Crnkovic and Larsson, 2002: 208).

This logic of reuse and sedimenting knowledge into modules in the software ecology is diametrically opposed to the overarching imperative of freshness in the advertising ecology (Nov and Jones, 2003). The quintessential demand for originality limits the scope for reuse and modularity on the level of the creative product to an absolute minimum, at least in principle. Although agencies seek to differentiate themselves from their main competitors through a particular aesthetic and a specific 'way of doing things', they also (somewhat paradoxically) desperately endeavour to avoid a particular 'house style'. The aim is to be distinct and yet not to be predictable since this would limit the market to exactly one customer.

### The epistemic community

The actual locus of knowledge production, of course, extends beyond the boundaries of the firm

and involves communities '[w]ho are in contact with the environment and involved in interpretive sense making, congruence finding and adapting. It is from any site of such interactions that new insights can be coproduced' (Brown and Duguid, 1991: 53). Deliberate knowledge creation more specifically ensues in 'epistemic communities' (Knorr Cetina, 1981; 1999). Epistemic communities are organized around the specific project task and a mutually recognized subset of knowledge issues. They are governed by a procedural authority endowed internally or externally to fulfil the goal (see Cowan et al., 2000). Within an epistemic community, agents are bound together by their commitment to enhance a particular set of knowledge. Individuals accumulate knowledge according to their own experience and validation is made according to the procedural authority: what is evaluated is the contribution of the agent to the cognitive goal with regard to the criteria set by the procedural authority (Amin and Cohendet, 2003: 123).

This understanding of epistemic communities might, indeed, more aptly depict organizational practices in the cumulative learning regime of the software ecology in which committed, enduring and close ties prevail. The very notion of 'community', however, connotes with a level of persistence, familiarity and intimacy that appears rather alien to the relentlessly shifting advertising ecology (see Lindkvist, 2003; see also Swan et al., 2002: 482–4 on 'communities of practice'). The concept of the epistemic community evokes a sense of order and coherence that not only seems absent but even not desired in the originality-fixated advertising ecology. The 'staged' antagonism and transience of ties in the disruptive learning regime might more appropriately be phrased in terms of an *epistemic collective* analogous to Lindkvist's (2003) idea of the knowledge collectivity.

Although, of course, organizational knowledge and routines inform the division of labour in the epistemic collectives of the advertising ecology as well, *individual* expertise and creativity enjoy, or at least strive for, unchallenged primacy. The distributed knowledge and learning within epistemic collectives resemble an 'undeveloped group with developed mind' (Weick and Roberts, 1993): although the short-project cycles prevent epistemic collectives from evolving into coherent communities with shared values, they are

nevertheless sufficiently connected through extended indirect and latent ties to behave 'as if' they were a group (Weick and Roberts, 1993: 118). While learning in the epistemic community is embodied in a continuous process of organizational socialization, individual learning in the epistemic collectives is rather driven by goal-oriented problem solving. However, despite their different social logics and temporal scales, epistemic communities as well as collectives extend beyond the firm to involve the same set of actors, that is clients, suppliers and corporate groups.

### *Clients*

In both ecologies, clients of course play a central role in knowledge production that is not confined to initiating and sponsoring the entire venture. Both ecologies are intrinsically driven by the strategic goal to transform a *single project* into a *lasting relationship*, that is into an account (note that it is the *account* and not the *project* manager in advertising). In both contexts, projects are thus strongly conceived as strategic pivots from where to leverage a continuous stream of business. As a consequence, the calculation of projects follows firm-specific rules of cost coverage in a less rigorous fashion if they, potentially at least, open the door to a lasting client relationship. Apart from sharing the interest in transforming projects into relationships, however, both ecologies rely on practices to 'lock in' clients that differ in kind and in intensity.

Although profound client involvement is a key feature of project ecologies more generally (see also Iansiti and Clark, 1994), in the Munich software ecology user participation appears particularly deep (see Lehrer, 2000: 592). In fact, the extent of user or client involvement ranks first in the determinants of successful project completion (see, for example, Beer, 2003: 22).<sup>5</sup> Software projects are frequently carried out on-site in ongoing conversation with the IT units as well as the end-users in the client's organization (Beer, 2003). Again, the approach of 'extreme programming (XP)' is pushing client involvement to its limits by involving an 'onsite customer' (Baer, 2003: 129) including 'a real, live user on the team, available full-time to answer questions'. By embracing the client into the

simultaneous engineering of different project teams, the discursive pragmatic of 'collaborative engineering' unfolds (Neff and Stark, 2003; see also Heydebrand and Mirón, 2002: 1963; Jeppesen, 2002).

The intensity of client involvement is propelled by the inherently systemic character of software. The client's expectations and ideas, although specified in the brief, typically do not crystallize into more concrete specifications before the project process has yielded some interim variants (Beer, 2003: 29). And as the software becomes more complex in the course of the project, so do the implications of even seemingly simple changes that ramify throughout the entire client organization and its 'legacy system' operating on older platforms of controlling production, purchasing, billing or data storage (see Keipingger, 2003).

Even within shorter project cycles and despite elaborate 'change request' and 'change control' tools (Lannes, 2003: 336–7) project specifications are often found to be 'racketing up' (Jurison, 1999: 33; see also Girard and Stark, 2002: 1940). Such 'scope creep' notoriously puts pre-calculated plans of resource allocation at risk. Nevertheless, '[m]ost software engineers understand that freezing is an undesirable action because it means commitments to a set of requirements which are obsolete upon delivery of the system' (Bourque et al., 2002: 67). Viewed from a more strategic point of view, however, scope creep might not only benefit the usefulness of the software (see also MacCormack, 2001); it could also open up prospects for turning the single project into a lasting tie (Casper and Whitley, 2002: 24). The repertoire for this sort of *strategic scope creep* (that is to *deliberately* 'lock in' clients by increasing interdependencies) in software is wide and ranges from training of the client's staff, stand-by advice through a hot line to technical maintenance, including regular updates and debugging.

The less intense client involvement in advertising is interrelated with lower degrees of technical and organizational interdependencies of the project output with the existing business of the client. Of course, campaigns and brands developed by advertising agencies have to correspond with key features of the client's organization and culture. Such interdependencies, however, are more an issue of interpretive plausibility than of technical

compatibility. Consequently, the leeway for strategic scope creep in advertising is much more limited in general, and is confined to establishing personal trustful relationships. In a context in which interaction resembles less the 'facts-and-figures' exchange of business parlance but is strongly coloured (quite literally) by individual taste and aesthetic preferences, trust in the (style-) expert's judgement and advice is of considerable value.

Trust does not equal involvement, however. Rather, high levels of trust afford lower degrees of channelling and controlling the creative process. Trust, among others, is nurtured through a practice referred to in advertising as 'educating clients' (see also Quinn, 1999: 33). This practice encompasses, besides defining basic standards for the aesthetic dimensions of the project task, clarifying the division of labour that is rooted in mutual respect for professional competencies. Whereas client involvement in software is strongly driven by the necessities (and leveraged opportunities) to integrate the project output into organizational and technical 'legacy systems' or 'neighbourhood systems', client participation in advertising is limited by the creative ethos that demands (at least temporary) autonomy and independence from the interference of clients who symptomatically associate creativity with risk (see also Bullmore, 1999).

### *Suppliers*

The different degrees of client involvement correspond in a sense with inverted roles of suppliers, i.e. the higher degree of client involvement corresponds with a relatively smaller scope and lower intensity of ties with collaborators in the software ecology. While larger product-oriented corporations rely on supplier networks for recurring cycles of client-specific adaptation and implementation, smaller projects-only specialists seem to prefer in-house solutions vis-à-vis extended supplier networks. In fact, freelancing is typically derogated as 'body-leasing' and the renunciation of external suppliers is an integral part of the corporate culture, as unequivocally stated in the company profile of a medium-sized project specialist: 'Corporate policy was and is not to

pursue body-leasing ... [this firm] exclusively relies on permanent staff since only they fully identify themselves with the company. Freelancers in contrast are first of all companies of their own.' The consequent low supplier involvement seems strongly driven by the size of projects. Although the average size of software projects in the Munich ecology varies considerably, projects such as the development of a global ordering system for DaimlerChrysler can demand up to 200 or more staff-years.

The modularization of projects as well as the analytical professional ethos favour a partition of jobs and responsibilities among project collaborators that resembles *orchestration* in the sense of a comparatively clear assignment of jobs and responsibilities and exact timing. Due to the size and technical complexities of projects (see also Fichman and Kemerer, 2001: 58), a high premium is put again on continuity. Long-term collaboration with a relatively stable set of suppliers in addition, of course, not only lowers transaction costs but also affords interactive learning processes that benefit the subsequent maintenance and upgrading of software which has a lifespan of up to 10–15 years (Siedersleben, 2003: 1).

In contrast, the evolution of extended supplier networks in the advertising ecology is not driven merely by the size of projects but rather by the diversity of skills involved. Whereas the participation of technical specialists follows similar principles of hierarchical synchronization and modularization of tasks, collaboration with creative professionals involves turbulence, ambiguity and ongoing 'redistribution of improvisation rights' (Weick, 1998: 549). The analytical and methodological ethos in the software ecology stands out against a creative culture epitomized by the attitude: 'as long as the show was on time, it was not important how it was achieved' (Hartmann et al., 1998: 272).

Thus, collaboration with creative suppliers, rather than orchestration, mimics features of (jazz) *improvisation*, a 'prototype organization' designed to maximize innovation (see Hatch, 1999; Grabher, 2001: 367–9). Improvisation, essentially, implies a deliberate interruption of habit patterns, and resistance to the temptation to become locked into routines of past success which might stifle experimentation. One of the most widespread

practices in improvisation is 'taking turns', that is swapping back and forth the roles of soloing and supporting other soloists and thereby rotating 'leadership'. Just as jazz bands vary their composition of instruments and players, ties with suppliers are reconfigured from project to project around a relatively stable set of core relationships. This variance in composition reflects, on the one hand, obvious particularities of a specific project. On the other hand, collaborative ties with suppliers are deliberately interrupted or terminated for the sake of the overarching imperative of freshness (see also Usai et al., 2001). The contrasting logics of learning in both ecologies here play out as the opposition between the common-sense '*never* change a winning team' and the challenge to '*always* change a winning team' (see Mayer, 2002).

### *Corporate groups*

Knowledge practices are increasingly moulded by the corporate groups into which both ecologies become tied. The role of large corporate groups in both ecologies defies any straightforward mapping onto a global versus local geography since the groups embody and signify both indigenous ties as well as exogenous connections (see also Amin and Cohendet, 2003: 163). Rather than being the disentangling of geographical scales, primary concern here is with the different modes of corporate affiliation and their bearing on knowledge practices in both ecologies.

In the software ecology the importance of corporate groups is immediately obvious through the presence of truly global software brand names like SAP, Oracle, and first and foremost, Siemens, *the* incubator of the Munich high-tech agglomeration. Their role in the Munich ecology is not only based on ownership or financial control but also on the Archimedian pivots of the software business more generally; that is, compatibility and standards (see also Casper and Glimstedt, 2001). Beyond direct ownership, smaller firms are often tied to corporate groups through licence agreements. These arrangements, in their more visible dimension, primarily refer to the distribution and client-specific adaptation (of a certain range) of

the product portfolio of the large corporations in the context of recurrent projects.

Licence agreements thus generate cycles of learning, or at least sporadic feedback, from the frontline of application projects to the sedimentation of process knowledge and the refinement of corporate tools and of substance knowledge through the evolution of the product portfolio. This continuous inflow of corporate methods, standards and tools yields some positive reputation effects in the software ecology, in which the label 'Oracle approved/Oracle authorized', for example, facilitates access to clients. In a similar vein, ownership ties to large corporate brands in the consulting or financial sectors are perceived as beneficial for the esteem and standing of the software firm.

The significance of the large corporate domain in the advertising ecology is far less perceptible (and deliberately so), although it impacts likewise in fundamental ways on knowledge practices. More and more agencies in the Soho ecology are tied by more or less direct forms of ownership control into the global corporate networks of the three leading communication groups, Interpublic, WPP, and Omnicom (see also Nachum and Keeble, 1999; 2000). Since corporate affiliation is often limited to financial control, they provide only comparatively narrow channels through which corporate tools and cultures diffuse into the ecology, and project experience is fed back into the corporate network. Although corporate groups, such as WPP for example, set up 'knowledge communities' which share non-confidential insights and case-study evidence (WPP, 2001; 2002a; 2002b), the scope for post-project and cross-project learning within the corporate network is considerably smaller, not least due to the pronounced variety of (agency-)cultures and styles within these groups.

Whereas the corporate groups in software crystallize primarily around products, in the advertising ecology they evolve around clients. The key rationale of corporate groups in advertising is to enhance the ability to provide clients with services on a global scale and in a cross-disciplinary fashion including the entire spectrum of communication services (Leslie, 1995; Grabher, 2002b: 256). While for software firms the involvement with a group extends both the range of modules and the portfolio of skills, group affiliation for advertising agencies

only broadens the spectrum of skills from which to compose core teams.

Although the organizational backing of a major corporate group enhances an agency's business reputation and hence facilitates the transformation of projects into lasting client ties, its association with one of the 'Wall Street behemoths' impacts negatively on its creative reputation. For creatives, the efficiency-driven manuals and standardized corporate toolkits for project organization inevitably thwart the creative process, which not only demands distance from client interference but also from uniform corporate organizational principles (see, for example, Shelbourne and Baskin, 1998).

### The awareness space

Epistemic communities and collectives are built around actual production networks that, in a sense, embody the 'plumbing' of the project ecologies (see also Podolny, 2001; Owen-Smith and Powell, 2002). Each project prompts a reconfiguration (in software a minor one, in advertising a more significant one) of the 'pipes' through which resources are conveyed to achieve the specific project aim. Project ecologies, however, also enact an awareness space that extends beneath and beyond the manifest pattern of the actual production networks. Project ecologies thereby co-produce their knowledge environment (see Weick, 1995: 30). Whereas the core teams, firms and epistemic communities have organizational boundaries and a perceptible inside and outside, awareness space does not; it is an open environment.

Although the awareness space unfolds its distinct geography, the paper once more aims to eschew a straightforward local-global dichotomy (see also Amin and Cohendet, 2003). Consequently, the attempt to explore the awareness space, is not intended to evoke a *geographical* scaling of knowledge practices but essentially seeks to identify different social logics of diffuse learning that epitomize different degrees of embeddedness and varying combinations of strategic and communicative rationality. The proposed social and communicative logics, of course, do not epitomize arithmomorphic concepts, nor are they mutually exclusive but rather interpenetrate each other.

Nevertheless, diffuse learning in both project ecologies seems to adhere to qualitatively different principles that, in a first approach, resonate with Tönnies's (1979) paradigmatic distinction between *Gesellschaft* and *Gemeinschaft* (see Wittel, 2001; see Table 1).

### *Communality*

The notion of communality signifies networking that involves long-lasting, intense and thick ties, in which the private is at least as strong as the professional dimension. Relations are based on mutual experience, common history or narratives. Communality typically originates through shared experience at school or university and evolves into enduring bonds that embrace mutual acquaintance with families and friends of particular network members. Most importantly, the social realm of communality affords a key condition for the evolution of trust, that is the duration of 'linear time' (Sennett, 1998; see also Bauman, 1996: 51).

Although communality is of course present in both ecologies, it appears to be of higher relevance in the software ecology. The cumulative learning regime in software translates into comparatively long affiliations with firms which in turn reduce the likelihood that network ties with former colleagues from university days, current work-mates or long-term clients are disrupted by interfirm and

interregional mobility. Communality in the software cluster epitomizes the coherence of a neighbourhood,<sup>6</sup> and socializing is typically confined to staying in.

Network communality is strongly moulded by the private dimension and 'communicative rationality', and yet it is also instrumental in the project ecology. Its functions relate less to either enculturation and (project-)skill formation (this is afforded primarily by the epistemic community) or to the acquisition and juggling of projects (this is mainly achieved within the firm). Rather, network communality provides a sounding board for contemplating career decisions, discussing conflicts within the core team, exchanging experience with specific tools and methods and reflecting on technical and organizational issues beyond the day-to-day project frenzy.

### *Sociality*

In contrast to the thick and lasting relationships in communality, the notion of sociality emphasizes ephemeral, yet intense networking (Wittel, 2001: 51). In sociality, social relationships are less 'narrational', that is they are less based on mutual experience or a common history but primarily on an exchange of knowledge and on 'catching up' (see also Kotamraju, 2002). Linear time in sociality is partitioned into 'serial time', defined by cycles of

**Table 1** Stylized features of the awareness space

	Communality	Sociality	Connectivity
	<i>software</i>	<i>advertising</i>	<i>software</i>
Nature of ties	lasting, intense	ephemeral, intense	ephemeral, weak
Character of communication	private with professional	professional with private	professional
Substance	narration	knowledge	information
Governance	trust	swift trust	peer recognition
Focus	relationship-oriented	career-oriented	task-oriented
Socio-spatial metaphor	neighbourhood	city	(virtual) club
Medium	face-to-face	face-to-face	virtual
Social practice	'staying in'	'hanging out'	'logging on'

(comparatively short) projects, contracts and firm affiliations. The shorter project cycles hardly leave time to develop personalized trust based on shared experience, familiarity or social coherence. Instead, sociality involves 'swift trust' (Meyerson et al., 1996) which, most importantly, is category-driven trust; network members deal with one another more as roles than as individuals.

Although sociality, very much like communality, pervades both ecologies, it is the archetypal form of networking in the advertising ecology. The disruptive knowledge practice of learning by switching (teams, agencies, suppliers, clients) here renders an ongoing rewiring of relationships and swapping of jobs and projects. Sociality signifies an immediate intersubjectivity (Wittel, 2001: 51) that is integral to Koolhaas's concept of the 'generic city' (OMA et al., 1995). The socio-spatial metaphor of the neighbourhood in communality contrasts with urbanity in sociality; diversity of contacts, serendipity of encounters, accidental interaction, 'noise' (Grabher, 2002b) and exposure to strangeness (Simmel, 1950; see also Ibert, 2003) take the place of social coherence; communality's social practice of 'staying in' contrasts with the convention of 'hanging out' in sociality; whereas hanging out in the city stimulates creation, staying in the neighbourhood benefits re-creation.

Even though sociality also intricately blends communicative and strategic rationality, the instrumental dimension seems to prevail. In fact, networks are to some extent commodified (Wittel, 2001: 56): contacts with blue-chip clients or in-vogue creatives are 'stored', 'exchanged' and – as trade parlance reveals – even 'stolen'.<sup>7</sup> Sociality, indeed, fulfils indispensable functions in the advertising ecology. First, hanging out is an essential practice for enculturation and for acquiring the codes and 'habitus' (Bourdieu, 1983) of the trade (which is less afforded here by the firm). Second, sociality provides critical information about job opportunities for the nomadic project worker as well as on pending accounts and thus on potentially upcoming projects (see also DeFillippi and Arthur, 1998; Ekinsmyth, 2002; Blyler and Coff, 2003).

The significance of such information is indicated by the contents of the leading British trade journal, *Campaign*, that prominently features the movements of key professionals within the ecology as well as speculations about expected splits between clients

and agencies throughout the first few pages of each issue. Instead of knowledge *in* firms, sociality helps to generate knowledge *about* firms and potential collaborators, their availability and reliability as well as other critical project skills (which are not certified in degrees) (see Brown and Duguid, 2000b: 20). Third, sociality provides a sounding board for interpreting and deciphering the surrounding 'noise' of rumours, impressions, recommendations, trade folklore and strategic misinformation. And finally, the frenzied sociality seems imperative for keeping a certain work 'pace' and 'rhythm' in the pulsating advertising ecology (on the essential role of pace and rhythm in project work, see Bragd, 2003: 9; English-Lueck et al., 2002: 96).

### *Connectivity*

The concept of connectivity denotes the socially thinnest and culturally most neutral (in a sense, the most weakly embedded) mode of networking. (Phrased in the technoid jargon of the software ecology, the social 'bandwidth' decreases from communality through sociality to connectivity.) Whereas communication in communality amalgamates friendship and professional issues, and sociality more strategically supports business agendas with private matters, communication in connectivity is relatively distant from the personal realm and most succinctly focuses on specific tasks (see also Alavi and Leidner, 2003). Social relations are almost purely informational. As much caused by as resulting from the low level of social embeddedness, connectivity is confined to virtual forms of interaction while communality and sociality are essentially face-to-face modes of networking.

Connectivity plays only a minor role in the advertising ecology in which the convention of face-to-face interaction and a 'people business'-culture predominates. Moreover, despite the availability of increasing bandwidth in virtual communication, the colour tone in the proofs, the quality of the paper for the brochure, the spatiality of the package design have to be checked through *physical* inspection. The software ecology in contrast, and hardly surprisingly, displays a strong affinity to virtual forms of interaction such as online forums<sup>8</sup> or

mailing lists: 'Software professionals like e-mail's ability to be precise and culturally neutral, and they instinctively like its asynchronicity' (*Computerworld*, 8 December 1997). The social practice in connectivity is 'logging on', the socio-spatial metaphor of connectivity is the (virtual) club in which membership is bound to a certain expertise which allows meaningful interaction with other club members. Connectivity shares with communality some degree of coherence (both evolve and deepen around a certain profession); with sociality it has a degree of serendipity in common: although attending the club most often follows a particular intention, it involves accidental interaction and unexpected knowledge encounters.

In these virtual and ephemeral forms of exchange the evolution of personalized trust seems extremely demanding, though not unfeasible in principle, of course (see Sarbaugh-Thompson and Feldman, 1998; Montoya-Weiss et al., 2001; English-Lueck et al., 2002). Connectivity does not unfold the dynamics of category-driven 'swift trust' in which actors deal with one another more as roles or professions than as individuals. Nevertheless, online forums depend on a sort of reciprocity to elude the *tragedy of the (virtual) commons*. Virtual sources, in other words, have to be preserved from an imbalance of (little) nourishing and (high) utilization that increasingly undermines the value of the source (see also Kollock, 1999). Although hardly a functional equivalent to (swift) trust, peer recognition seems a potent social governance principle to elicit a continuous stream of inputs into the online forum 'because the technology allows for optimal transparency' (Jeppesen, 2002: 11).

In the software ecology, online forums and mailing lists fulfil two functions (see also Lee and Cole, 2000; Kotamraju, 2002: 16–18). First and particularly in the context of open-source codes like Linux, they provide virtual construction sites where codes are updated, modified and repaired (that is, places where developers do the actual programming work). Second, they afford a virtual arena where information is exchanged and problems and their respective solutions are discussed (that is, places where developers talk about the work they do; see also Lanzara and Morner, 2003: 24).

## Conclusions

The aim of this paper was, first, to unfold project ecologies both as ensembles of organizations, communities and networks and also as ecologies of organizational logics, professional ethos and individual identities and loyalties. By exploring project ecologies through a non-essentialist perspective of geographic inquiry that embraces the incoherence of actors and multiplicity of logics (Lee, 2002: 340–1; Ettlinger, 2003; see also Massey, 1997; Whatmore, 1997; Dicken et al., 2001; Amin and Cohendet, 2003) the papers ought to problematize and dehomogenize notions of firms, networks and learning that also underpin current reasoning in economic geography.

Second, the paper contrasted two project ecologies which are driven by opposing logics of creating, using and sedimenting knowledge. The key imperatives in the first ecology are accumulation and modularization of knowledge. This cumulative learning logic is exemplified by the software ecology in Munich which is confronted with a learning regime driven by the maxims of originality and creativity. 'Learning by switching' here signifies the emblematic knowledge practice that is exemplified by the London advertising ecology. The paper explored these learning modes by analysing the anatomy of the 'plumbing' (Podolny, 2001) of the productive networks within and between the core team, the firm, and the epistemic community tied together for the completion of a specific project. In addition, however, the paper also directed attention to more diffuse learning processes in an awareness space that extends beyond and beneath the actual production ties and that stretches around more lasting networks.

Instead of mapping the awareness space along a simplistic scalar nesting of network density and knowledge types (reduced to a global vs local dichotomy), the paper, third, proposed a differentiation that primarily involves social and communicative dynamics within the networks around which this social space unfolds. The analysis thus intended to follow the proposition for thinking about knowledge spaces *topologically*. This allows an understanding of individual sites as a node of multiple knowledge connections of varying intensity and spatial distance and as relay point of translating knowledges that cannot be territorially attributed in

a straightforward fashion (Amin and Cohendet, 2003: 154; see also Allen, 2000; Gertler, 2003).

Network practices in the awareness space symptomatically efface the distinction between the communicative logic in the 'life world' and the strategic rationality in the 'system world' (Habermas, 1981). *Communality* signifies lasting and intense ties, *sociality* denotes intense and yet ephemeral relations, and *connectivity* indicates transient and weak networks. Communality epitomizes the social coherence and stability of the neighbourhood, while sociality resembles the diversity, serendipity and exposure to strangeness of the city. Connectivity, eventually, matches the relative exclusiveness of a (virtual) club in which membership requires a certain expertise. While the awareness space of the software ecology seems primarily to involve communality and connectivity, sociality appears as the central networking logic in the awareness space of the advertising ecology.

### Acknowledgements

I owe sincere thanks to the participants in the subtheme 'Project Organizations, Embeddedness and Repositories of Knowledge' of the EGOS Colloquium in Copenhagen (July 2003) for an exciting discussion of an earlier draft of this paper. I am also grateful to Oliver Ibert for his reflections in the course of our joint project 'Production in Projects' funded by the Deutsche Forschungsgemeinschaft (DFG: GR 1913/3).

### Notes

<sup>1</sup> In methodological terms, the paper draws on the findings of two qualitative research projects on project-based organizing. The account on the advertising ecology is derived from 78 semi-structured interviews in advertising agencies and collaborating film- and post-production companies which have been conducted in Spring 1998, Summer 2000 and Summer 2002 in central London. Information was supplemented by a variety of secondary sources including interviews with representatives of the Institute of Practitioners in Advertising (IPG) and the Account Planning Group (APG) and data from industry reports, trade press, business reports, and press releases.

The portrait of the software ecology draws on data gathered in 24 semi-structured interviews in Munich software firms that were conducted by Gernot Grabher and Oliver Ibert between Spring 2003 and Summer 2003. The somewhat asymmetric empirical base of the paper inflicts two substantive caveats. First, whereas the material on the software ecology reflects a first and most recent snapshot, the account of the advertising ecology is distilled from research stretching over several years. Second, the comparison of both *sectoral* ecologies reflects, to some extent, differences in *national* practices and institutions. While the latter issue in particular has to be addressed in subsequent papers, the chief aim of this paper is *not* to provide an idiographic historical-geographical account of the Munich and London clusters. At issue in this paper are rather the systematic differences between the stylized versions of disruptive and cumulative modes of project-based learning which are illustrated against the background of both ecologies.

- <sup>2</sup> Although the actual practice of projects symptomatically seems to deviate from these best-practice procedures, they play an important role in acquiring new projects by signalling method and transparency to the client (Lindkvist, 2003).
- <sup>3</sup> Vast 'blackboards' indeed: these manuals on firm-specific best practice might, as in one of the large software firms interviewed, pile up to 14 massive volumes of documentation.
- <sup>4</sup> A most blatant manifestation of this highly personalized understanding of the firm is seen in agency names that typically combine the founders' names; for example, Bogle, Bartle, Hegarty.
- <sup>5</sup> SAP, for example, is currently restructuring its R&D of 8,400 staff from an organization along product lines to one based on key client groups (*Süddeutsche Zeitung*, 29 July 2003).
- <sup>6</sup> The notion of neighbourhood has been suggested to me by Oliver Ibert.
- <sup>7</sup> The strategic dimension of networking is blatantly exposed in a statement from a co-organizer of networking events in new media (NetProZ): 'A network is based on a key principle – the exchange of currency. We're not talking about money ... we're talking about information. Networks thrive on a complex arrangement of exchange rates and credit facilities. To me a phone number might be nothing, but to you having it could change your life and put you in my debt. Effective networkers understand this. They play to it, offering a titbit here and a bit of advice there, then calling in the slips when they need a favour' ([www.garol.com/theview](http://www.garol.com/theview)).
- <sup>8</sup> The widespread notion of 'online community' seems not entirely appropriate since the notion of the community epitomizes, as already indicated, a degree of social coherence and proximity that symptomatically is absent in these forms of virtual exchange.

## References

- Alavi, M. and Leidner, D. (2003) 'An Exploratory Study of Managerial Leadership in Virtual Environments', paper presented at the Academy of Management Meeting (Aug.), Seattle.
- Allen, J. (2000) 'Power/Economic Knowledges: Symbolic and Spatial Formations', in J. Bryson, P.W. Daniels, N. Henry and J. Pollard (eds) *Knowledge, Space, Economy*, pp. 15–33. London: Routledge.
- Alvesson, M. (2000) 'Social Identity and the Problem of Loyalty in Knowledge Intensive Companies', *Journal of Management Studies* 37 (8): 1101–23.
- Amin, A. and Cohendet, P. (2003) *Architectures of Knowledge: Firms, Competences and Communities*. Oxford: Oxford University Press.
- Argyris, C. and Schön, D.A. (1978) *Organizational Learning: a Theory of Action Perspective*. Reading, MA: Addison-Wesley.
- Baer, M. (2003) 'The New X-men', *Wired* (Sep.): 124–9.
- Bain & Company (2001) *Hightech-Standorte im Weltvergleich. Erfolgskriterien und Herausforderungen für die Zukunft* [High-tech locations in global comparison. Criteria for success and future challenges]. Munich: Bain Prints.
- Bauman, Z. (1996) 'Morality in the Age of Contingency', in P. Heelas, S. Lash and P. Morris (eds) *Detraditionalization: Critical Reflections on Authority and Identity*. Oxford: Blackwell.
- Beer, J. (2003) 'Systemspezifikation', in J. Siedersleben (ed.) *Softwaretechnik. Praxiswissen für Software-Ingenieure*, pp. 27–47. München: Hanser.
- Bengtsson, M. and Söderholm, A. (2002) 'Bridging Distances: Organizing Boundary-spanning Technology Development Projects', in G. Grabher (ed.) *Production in Projects: Economic Geographies of Temporary Collaboration. Regional Studies Special Issue* 36 (3): 263–75.
- Bigley, G.A. and Roberts, K.H. (2001) 'The Incident Command System: High Reliability Organizing for Complex and Volatile Task Environments', *Academy of Management Journal* 44 (6): 1281–99.
- Bilton, C. and Leary, R. (2002) 'What Can Managers Do for Creativity? Brokering Creativity in the Creative Industries', *International Journal of Cultural Policy* 8 (1): 49–64.
- Bingham, N. and Thrift, N. (2000) 'Some New Instructions for Travellers: the Geography of Bruno Latour and Michel Serres', in M. Crang and N. Thrift (eds) *Thinking Space*. London: Routledge.
- Blyler, M. and Coff, R.W. (2003) 'Dynamic Capabilities: Social Capital and Rent Appropriation: Ties that Split Pies', *Strategic Management Journal* 24 (7): 677–86.
- Boltanski, L. and Chiapello, E. (1999) *Le Nouvel Esprit du Capitalisme*. Paris: Gallimard.
- Bourdieu, P. (1983) *Zur Soziologie der symbolischen Form*. Frankfurt: Suhrkamp.
- Bourque, P., Dupuis, R., Abran, A., Moore, J.W., Tripp, L. and Wolff, S. (2002) 'Fundamental Principles of Software Engineering – a Journey', *Journal of Systems and Software* 62 (1): 59–70.
- Brady, T. and Davies, A. (2003) 'Learning in Project-based Firms: From Unique to Repeatable Solutions', paper presented at the 19th EGOS Colloquium (July), Copenhagen.
- Bragd, A. (2003) 'Knowing Management. An Ethnographic Study of Tinkering with a New Car', paper presented at the 19th EGOS Colloquium (July), Copenhagen.
- Bresnen, M. (2003) 'Competing Discourses? Project Management and Organizational Change', paper presented at the workshop Making Projects Critical (Apr.), Bristol.
- Brown, J.S. and Duguid, P. (1991) 'Organizational Learning and Communities of Practice: Towards a Unified View of Working, Learning, and Innovation', *Organizational Science* (2) 1: 40–57.
- Brown, J.S. and Duguid, P. (2000a) *The Social Life of Information*. Boston, MA: Harvard Business School Press.
- Brown, J.S. and Duguid, P. (2000b) 'Mysteries of the Region: Knowledge Dynamics in Silicon Valley', in C.M. Lee, W.F. Miller, M.G. Hancock and H.S. Rowen (eds) *The Silicon Valley Edge. A Habitat for Innovation and Entrepreneurship*, pp. 16–39. Stanford, CA: Stanford University Press.
- Brusoni, S. and Prencipe, A. (2001) 'Unpacking the Black Box of Modularity: Technology, Product, and Organisation', *Industrial and Corporate Change* 10 (1): 179–205.
- Bullmore, J. (1999) 'The Advertising Creative Process', in J.P. Jones (ed.) *The Advertising Business*, pp. 55–61. London: Sage.
- Burt, R. (1992) *Structural Holes: the Social Structure of Competition*. Cambridge, MA: Harvard University Press.
- Casper, S. and Glimstedt, H. (2001) 'Economic Organization, Innovation Systems, and the Internet', *Oxford Review of Economic Policy* 17 (2): 265–81.
- Casper, S. and Whitley, R. (2002) 'Managing Competences in Entrepreneurial Technology Firms: a Comparative Institutional Analysis of Germany, Sweden and the UK', Working Paper No. 230, ESRC Centre for Business Research, University of Cambridge.
- Chandler, A.D. (1990) *Scale and Scope: the Dynamics of Industrial Capitalism*. Cambridge, MA: Harvard University Press.
- Cowan, R., David, P. and Foray, D. (2000) 'The Explicit Economics of Knowledge Codification and Tacitness', *Industrial and Corporate Change* 9 (2): 212–53.
- Crnkovic, I. and Larsson, M. (2002) 'Challenges of

- Component-based Development', *The Journal of Systems and Software* 61 (3): 201–12.
- Davies, A. and Brady, T. (2000) 'Organizational Capabilities and Learning in Complex Product Systems: Towards Repeatable Solutions', *Research Policy* 29 (7–8): 931–53.
- DeFillippi, R.J. and Arthur, M.B. (1998) 'Paradox in Project-based Enterprise: the Case of Film Making', *California Management Review* 40 (2): 125–38.
- DeFillippi, R.J., Arthur, M.B. and Lindsay, V. (2003) 'Knowledge Work, the Knowledge Diamond and its Enacted Knowledge Space', paper presented at the 19th EGOS Colloquium (July), Copenhagen.
- Dicken, P., Kelly, P.P., Olds, K. and Yeung, H.W.-C. (2001) 'Chains and Networks, Territories and Scales: Towards a Relational Framework for Analysing the Global Economy', *Global Networks* 1 (2): 89–112.
- Dornisch, D. (2002) 'The Evolution of Post-socialist Projects: Temporary Shift and Transitional Capacity in a Polish Region', in G. Grabher (ed.) *Production in Projects: Economic Geographies of Temporary Collaboration. Regional Studies Special Issue* 36 (3): 307–21.
- Dubé, L. (1998) 'Teams in Packaged Software Development. The Software Corp. Experience', *Information, Technology and People* (11) 1: 36–61.
- Ekinsmyth, C. (2002) 'Project Organization, Embeddedness and Risk in Magazine Publishing', in G. Grabher (ed.) *Production in Projects: Economic Geographies of Temporary Collaboration. Regional Studies Special Issue* 36 (3): 229–45.
- Ekstedt, E., Lundin, R.A., Söderholm, A. and Wirdenius, H. (1999) *Neo-industrial Organizing. Renewal by Action and Knowledge in a Project-intensive Economy*. London: Routledge.
- English-Lueck, J.A., Darrah, C.N. and Saveri, A. (2002) 'Trusting Strangers: Work Relationships in Four High-tech Communities', *Information, Communication & Society* 5 (1): 90–108.
- Engwall, M. (2003) 'No Project is an Island: Linking Projects to History and Context', *Research Policy* 32 (5): 789–808.
- Ettlinger, N. (2003) 'Cultural Economic Geography and a Relational and Microspace Approach to Trusts, Rationalities, Networks, and Change in Collaborative Workplaces', *Journal of Economic Geography* 3 (2): 145–71.
- Faulkner, R.R. and Anderson, A.B. (1987) Short-term Projects and Emergent Careers, Evidence from Hollywood', *American Journal of Sociology* 92 (4): 879–909.
- Fichman, R.G. and Kemerer, C.F. (2001) 'Incentive Compatibility and Systematic Software Reuse', *The Journal of Systems and Software* 57 (1): 45–60.
- Gaddis, P.O. (1959) 'The Project Manager', *Harvard Business Review* 3: 89–97.
- Gann, D.M. and Salter, A.J. (2000) 'Innovation in Project-based, Service Enhanced Firms: the Construction of Complex Products and Systems', *Research Policy* 29 (7–8): 955–72.
- Gaver, W.W. (1996) 'Affordances for Interaction: the Social is Material for Design', *Ecological Psychology* 8 (2): 111–29.
- Gertler, M.S. (2003) 'Tacit Knowledge and the Economic Geography of Context, or the Undefinable Tacitness of Being (There)', *Journal of Economic Geography* 3: 75–99.
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P. and Trow, M. (1994) *The New Production Knowledge: the Dynamics of Science and Research in Contemporary Societies*. London: Sage.
- Girard, M. and Stark, D. (2002) 'Distributed Intelligence and Organizing Diversity in New Media Projects', in G. Grabher (ed.) *Fragile Sector, Robust Practice: Project Ecologies in New Media. Environment and Planning A Theme Issue* 34 (11): 1903–2092.
- Goodman, R.A. and Goodman, L.P. (1976) 'Some Management Issues in Temporary Systems: a Study of Professional Development and Manpower – the Theatre Case', *Administrative Science Quarterly* 21 (3): 494–501.
- Grabher, G. (2001) 'Ecologies of Creativity: the Village, the Group, and the Heterarchic Organisation of the British Advertising Industry', *Environment and Planning A* 33: 351–74.
- Grabher, G. (2002a) 'Cool Projects, Boring Institutions: Temporary Collaboration in Social Context', in G. Grabher (ed.) *Production in Projects: Economic Geographies of Temporary Collaboration. Regional Studies Special Issue* 36 (3): 205–15.
- Grabher, G. (2002b) 'The Project Ecology of Advertising: Tasks, Talents and Teams', in G. Grabher (ed.) *Production in Projects: Economic Geographies of Temporary Collaboration. Regional Studies Special Issue* 36 (3): 245–63.
- Grabher, G. (2002c) 'Fragile Sector, Robust Practice: Project Ecologies in New Media', in G. Grabher (ed.) *Environment and Planning A Theme Issue* 34 (11): 1903–2092.
- Grabher, G. (2003) 'Switching Ties, Recombining Teams: Avoiding Lock-in Through Project Organization?', in G. Fuchs and P. Shapira (eds) *Rethinking Regional Innovation and Change: Path Dependency or Regional Breakthrough?* Boston, MA, Dordrecht, London: Kluwer Academic Publishers.
- Grabher, G. and Powell, W.W. (2004) *Networks*. Cheltenham: Edward Elgar.
- Granovetter, M. (1973) 'The Strength of Weak Ties', *American Journal of Sociology* 78 (16): 1360–80.
- Granovetter, M. (1974) *Getting a Job*. Cambridge, MA: Harvard University Press.
- Habermas, J. (1981) *Theorie des kommunikativen Handelns*, Vols 1–2. Frankfurt: Suhrkamp.

- Hargadon, A. (1998) 'Firms as Knowledge Brokers: Lessons in Pursuing Continuous Innovation', *California Management Review* 40 (3): 209–28.
- Harris, S.J. (1998) 'Long-distance Corporations, Big Sciences, and the Geography of Knowledge', *Configurations* 6 (2): 269–304.
- Hartmann, F., Ashrafi, R. and Jergaacs, G. (1998) 'Project Management in the Live Entertainment Industry: What is Different?', *International Journal of Project Management* 16 (5): 269–81.
- Hatch, M.J. (1999) 'Exploring the Empty Spaces of Organizing: How Improvisational Jazz Helps Redescribe Organizational Structure', *Organization Studies* 20 (1): 75–100.
- Hedberg, B. and Wolff, R. (2001) 'Organizing, Learning, and Strategizing: From Construction to Discovery', in M. Dierkes, A. Berthoin-Antal, J. Child and I. Nonanka (eds) *Handbook of Organizational Learning and Knowledge*. Oxford: Oxford University Press.
- Heydebrand, W. and Mirón, A. (2002) 'Constructing Innovativeness in New-media Start-up Firms', in G. Grabher (ed.) *Fragile Sector, Robust Practice: Project Ecologies in New Media. Environment and Planning A Theme Issue* 34 (11): 1951–84.
- Hodgson, D. (2002) 'Disciplining the Professional: the Case of Project Management', *Journal of Management Studies* 39 (6): 803–21.
- Iansiti, M. and Clark, K.B. (1994) 'Integration and Dynamic Capability: Evidence from Product Development in Automobiles and Mainframe Computers', *Industrial and Corporate Change* 3 (3): 557–605.
- Ibert, O. (2003) 'Projekte und Innovation. Projektorientierung in der Entwicklungsplanung als Antwort auf das Problem der Organization von Innovation', *Raumforschung und Raumordnung* 1–2: 3–12.
- Ilvarasan, P.V. and Sharma, A.K. (2003) 'Is Software Work Routinized? Some Empirical Observations from Indian Software Industry', *The Journal of Systems and Software* 66 (1): 1–6.
- Jeppesen, L.B. (2002) 'Making Consumer Knowledge Available and Useful. The Case of the Computer Games', DRUID Working Paper, No. 01–10, Copenhagen Business School.
- Jones, C. (1996) 'Careers in Project Networks: the Case of the Film Industry', in M.B. Arthur and D.M. Rousseau (eds) *The Boundaryless Career*, pp. 58–75. Oxford: Oxford University Press.
- Jurison, J. (1999) 'Software Project Management: the Manager's View', *Communications of the Association for Information Systems* 2 (17).
- Keipinger, D. (2003) 'Software-Renovierung', in J. Siedersleben (ed.) *Softwaretechnik. Praxismwissen für Software-Ingenieure*, pp. 165–86. München: Hanser.
- Knorr Cetina, K. (1981) *The Manufacture of Knowledge*. Oxford: Pergamon Press.
- Knorr Cetina, K. (1999) *Epistemic Cultures: How the Sciences Make Knowledge*. Cambridge: Cambridge University Press.
- Kollock, P. (1999) 'The Economics of Online Cooperation: Gifts and Public Goods in Cyberspace', in M. Smith and P. Kollock (eds) *Communities in Cyberspace*. London: Routledge.
- Kotamraju, N. (2002) 'Keeping Up: Web Design Skill and the Reinvented Worker', *Information, Communication & Society* 5 (1): 1–26.
- Legendijk, A. (2001) 'Three Stories About Regional Salience: "Regional Worlds", "Political Mobilisation", and "Performativity"', *Zeitschrift für Wirtschaftsgeographie* 45 (3–4): 139–58.
- Lampel, J. and Jha, P.P. (2003) 'Reflective and Genetic Strategic Learning in Project-based Organizations', paper presented at the 19th EGOS Colloquium, (July), Copenhagen.
- Lannes, A. (2003) 'Projektmanagement', in J. Siedersleben (ed.) *Softwaretechnik. Praxismwissen für Software-Ingenieure*, pp. 321–42. München: Hanser.
- Lanzara, G.F. and Morner, M. (2003) 'The Knowledge Ecology of Open-source Software Projects', paper presented at the 19th EGOS Colloquium (July), Copenhagen.
- Lash, S. and Urry, J. (1994) *Economies of Signs and Space*. London: Sage.
- Lawson, C. and Lorenz, E. (1999) 'Collective Learning, Tacit Knowledge and Regional Innovative Capacity', *Regional Studies* 33 (4): 305–17.
- Lee, G.K. and Cole, R.E. (2000) 'The Linux Kernel Development as a Model of Knowledge Creation', Working Paper, Haas Business School, University of California, Berkeley.
- Lee, R. (2002) "'Nice Maps, Shame About the Theory"? Thinking Geographically About the Economic', *Progress in Human Geography* 26 (3): 333–55.
- Lehrer, M. (2000) 'From Factor of Production to Autonomus Industry: the Transformation of Germany's Software Sector', *Vierteljahreshefte für Wirtschaftsforschung* 69 (4): 587–600.
- Leslie, D.A. (1995) 'Global Scan: the Globalization of Advertising Agencies, Concepts and Campaigns', *Economic Geography* 71: 402–26.
- Lindkvist, L. (2003) 'Knowledge Communities and Knowledge Collectivities. Different Notions of Group Level Epistemology', paper presented at the 19th EGOS Colloquium (July), Copenhagen.
- Lundin, R.A. and Hartman, F. (eds) (2000) *Projects as Business Constituents and Guiding Motives*. Boston, MA, Dordrecht, London: Kluwer Academic Publishers.
- Lundin, R.A. and Midler, C. (1998) *Projects as Arenas for Renewal and Learning Processes*. Boston, MA, Dordrecht, London: Kluwer Academic Publishers.

- Lundin, R.A. and Söderholm, A. (1995) 'A Theory of the Temporary Organization', *Scandinavian Journal of Management* 11 (4): 437–55.
- MacCormack, A. (2001) Product-development Practices that Work: How Internet Companies Build Software', *Sloan Management Review* 42 (2): 75–84.
- Malmberg, A. and Maskell, P. (2002) 'The Elusive Concept of Localization Economies: Towards a Knowledge-based Theory of Spatial Clustering', *Environment and Planning A* 34 (3): 429–49.
- Maskell, P. (2001) 'The Firm in Economic Geography', *Economic Geography* 77 (4): 329–44.
- Massey, D. (1997) 'Economic/Non-economic', in R. Lee and J. Wills (eds) *Geographies of Economies*. New York: Arnold.
- Mayer, H-N. (2002) 'Mit Projekten planen. Empfehlungen über den Umgang mit einer neuen Planungsform'. Unpublished manuscript, University of Oldenburg.
- Meyerson D., Weick, K.E. and Kramer, R.M. (1996) 'Swift Trust and Temporary Groups', in R.M. Kramer and A. Tyler (eds) *Trust in Organizations: Frontiers of Theory and Research*, pp. 166–95. Thousand Oaks, CA: Sage.
- Midler, C. (1995) "Projectification" of the Firm: the Renault Case', *Scandinavian Journal of Management* 11 (4): 363–75.
- Mintzberg, H. (1979) *The Structuring of Organizations*. Englewood Cliffs, CA: Prentice Hall.
- Montoya-Weiss, M.M., Massey, A.P. and Song, M. (2001) 'Getting it Together: Temporal Coordination and Conflict Management in Global Virtual Teams', *Academy of Management Journal* 44 (6): 1251–62.
- Murdoch, J. (1999) 'The Spaces of Actor–Network Theory', *Geoforum* 29 (4): 357–74.
- Nachum, L. and Keeble, D. (1999) 'Neo-Marshallian Nodes, Global Networks and Firm Competitiveness: the Media Cluster of Central London', ESRC Centre for Business Research, Working Paper No. 138, Cambridge University.
- Nachum, L. and Keeble, D. (2000) Foreign and Indigenous Firms in the Media Cluster of Central London', ESRC Centre for Business Research, Working Paper No. 154, Cambridge University.
- Neff, G. and Stark, D. (2003) 'Permanently Beta: Responsive Organization in the Internet Era', in E.N. Howard and S. Jones (eds) *The Internet and American Life*. Thousand Oaks, CA: Sage.
- Nooteboom, B. (2000) 'Learning by Interaction: Absorptive Capacity, Cognitive Distance and Governance', *Journal of Management and Governance* 4: 69–92.
- Nov, O. and Jones, M. (2003) 'Ordering Creativity? Knowledge, Creativity, and Social Interaction in the Advertising Industry', Proceedings of the 4th Conference on Organisational Knowledge, Learning and Capabilities (Apr.), Barcelona.
- Oinas, P. (2000) 'Distance and Learning: Does Proximity Matter?', in F. Boekema, K. Morgan, S. Bakkers, and R. Rutten (eds) *Knowledge, Innovation and Economic Growth*, pp. 57–73. Aldershot: Edward Elgar.
- OMA, Koolhaas, R. and Mau, B. (1995) *S, M, L, XL*. Rotterdam: 010 Publishers.
- Owen-Smith, J. and Powell, W.W. (2002) 'Knowledge Networks in the Boston Biotechnology Community', paper presented at the conference on 'Science as an Institution and the Institution of Science' (Jan.), Siena.
- Perlow, L.A. (1999) 'The Time Frame: Toward a Sociology of Work Time', *Administrative Science Quarterly* 44 (1): 57–81.
- Podolny, J.M. (2001) 'Networks as Pipes and Prisms of the Market', *American Journal of Sociology* 107 (1): 33–60.
- Powell, W.W. (1990) 'Neither Market Nor Hierarchy: Network Forms of Organization', *Research in Organizational Behavior* 12: 295–336.
- Prencipe, A. and Tell, F. (2001) 'Inter-project Learning: Processes and Outcomes of Knowledge Codification in Project-based Firms', *Research Policy*, Special Issue on Knowledge Codification 30: 299–322.
- Quinn, J. (1999) 'The Account Executive in an Advertising Agency', in J.P. Jones (ed.) *The Advertising Business*, pp. 29–35. London: Sage.
- Sarbaugh-Thompson, M. and Feldman, M.S. (1998) 'Electronic Mail and Organizational Communication: Does Saying "Hi" Really Matter?', *Organization Science* 9 (6): 685–98.
- Scarbrough, H. (2001) 'Knowledge à la Mode: the Rise of Knowledge Management and its Implications for Views of Knowledge Production', *Social Epistemology* 15 (3): 201–13.
- Scarbrough, H., Laurent, S., Bresnen, M., Edelman, L., Newell, S. and Swan, J. (2003) 'Developing the Contextual View of Project-based Learning: Analysis of Case-studies', paper presented at the 19th EGOS Colloquium (July), Copenhagen.
- Scheidle, S. and Taubner, D. (2003) 'Projektmodel', in J. Siedersleben (ed.) *Softwaretechnik. Praxiswissen für Software-Ingenieure*, pp. 5–20. München: Hanser.
- Schoenberger, E. (1997) *The Cultural Crisis of the Firm*. Cambridge, MA: Blackwell.
- Schoenberger, E. (1999) 'The Firm in the Region and the Region in the Firm', in M. Gertler and T. Barnes (eds) *The New Industrial Geography*. London: Routledge.
- Sennett, R. (1998) *The Corrosion of Character: the Personal Consequences of Work in the New Capitalism*. New York: Norton.
- Shelbourne, J. and Baskin, M. (1998) 'The Requirements for Creativity: a Director's Perspective', in A. Cooper, (ed.) *How to Plan Advertising*. London: Cassell/The Account Planning Group.
- Siedersleben, J. (2003) 'Einführung', in J. Siedersleben

- (ed.) *Softwaretechnik. Praxiswissen für Software-Ingenieure*, pp. 1–4. München: Hanser.
- Simmel, G. (1950) 'The Stranger', in K. Wolff (ed.) *The Sociology of Georg Simmel*. New York: Free Press.
- Smith-Doerr, L. and Powell, W.W. (2003) 'Networks in Economic Life', in N. Smelser and R. Swedberg (eds) *The Handbook of Economic Sociology*. New York: Russell Sage Foundation.
- Solingen, R. van, Berghout, E., Kusters, R. and Trienekens, J. (2000) 'From Process Improvement, to People Improvement: Enabling Learning in Software Development', *Information and Software Technology* 42 (14): 965–71.
- Storper, M. (1997) *The Regional World: Territorial Development in a Global Economy*. New York: Guilford.
- Stützel, R. (2003) 'Wiederverwendung', in J. Siedersleben (ed.) *Softwaretechnik. Praxiswissen für Software-Ingenieure*, pp. 189–215. München: Hanser.
- Swan, J., Scarbrough, H. and Robertson, M. (2002) 'The Construction of "Communities of Practice" in the Management of Innovation', *Management Learning* 33 (4): 477–96.
- Swart, J., Kinnie, N. and Purcell, J. (2003) 'Managing the Careers of IT Professionals: a Competing Identity Perspective', paper presented at the Academy of Management Meeting (Aug.), Seattle.
- Sydow, J. and Staber, U. (2002) 'The Institutional Embeddedness of Project Networks: the Case of Content Production in German Television', in G. Grabher (ed.) *Production in Projects: Economic Geographies of Temporary Collaboration. Regional Studies Special Issue* 36 (3): 215–27.
- Sydow, J. and Windeler, A. (1999) 'Projektnetzwerke: Management von (mehr als) temporären Systemen', in J. Engelhardt and E. Sinz (eds) *Kooperation im Wettbewerb*. Wiesbaden: Gabler.
- Tamasy, C. and Sternberg, R. (2000) 'Regional Institutional and Policy Frameworks for High-technology SMEs in Europe', in D. Keeble and F. Wilkinson (eds) *High-technology Clusters, Networking and Collective Learning in Europe*. Aldershot: Ashgate.
- Taylor, M. and Asheim, B. (2001) 'The Concept of the Firm in Economic Geography', *Economic Geography* 77: 315–28.
- Thompson, M. and Heron, P. (2003) 'IT-professionals and Knowledge Creation: the Role of Social Capital', paper presented at the Academy of Management Meeting (Aug.), Seattle.
- Thrift, N.J. (1996) *Spatial Formations*. London: Sage.
- Thrift, N.J. (1997) 'The Stillpoint: Resistance, Expressive Embodiment, and Dance', in S. Pile and M. Keith (eds) *Geographies of Resistance*, pp. 124–51. London: Routledge.
- Tönnies, F. (1979) *Gemeinschaft und Gesellschaft: Grundbegriffe der reinen Soziologie*, 8th edn. Darmstadt: Wissenschaftliche Buchgemeinschaft.
- Usai, A., Delmestri, G. and Montanari, F. (2001) 'Human Capital, Social Capital and Performance: an Empirical Test from an Entrepreneurial Project-based Industry', Working Paper, SDA Bocconi Graduate School of Management, Milan.
- Uzzi, B. and Gillespie, J.J. (2002) 'Knowledge Spillovers in Corporate Financing Networks: Embeddedness and the Firm's Debt Performance', *Strategic Management Journal* 23 (7): 595–618.
- Weick, K.E. (1995) *Sensemaking in Organizations*. Thousand Oaks, CA: Sage.
- Weick, K.E. (1998) 'Improvisation as a Mindset for Organizational Analysis', *Organization Science* 9 (5): 543–55.
- Weick, K.E. and Roberts, K.H. (1993) 'Collective Mind in Organizations: Heedful Interrelating on Flight Decks', *Administrative Science Quarterly* 38 (3): 357–81.
- Wells, W., Burnett, J. and Moriarty, S. (1998) *Advertising Principles and Practices*. Upper Saddle River, NJ: Prentice Hall.
- Whatmore, S. (1997) 'Dissecting the Autonomous Self: Hybrid Cartographies for a Relational Ethics', *Environment and Planning D* 15: 37–53.
- Winch, G.M. (1986) 'The Labour Process and Labour Market in Construction', *International Journal of Sociology and Social Policy* 6 (2): 103–16.
- Wittel, A. (2001) 'Toward a Network Sociality', *Theory, Culture & Society* 18 (6): 51–76.
- WPP (2001) *Annual Report and Accounts*. London.
- WPP (2002a) *Group Navigator Handbook*. London.
- WPP (2002b) *Annual Report and Accounts*. London.
- Zeller, C. (2002) 'Project Teams as Means of Restructuring Research and Development in the Pharmaceutical Industry', in G. Grabher (ed.) *Production in Projects: Economic Geographies of Temporary Collaboration. Regional Studies Special Issue* 36 (3): 275–91.

### Correspondence to:

Gernot Grabher, Socio-economics of Space,  
University of Bonn, Meckenheimer Allee 166,  
53115 Bonn, Germany.  
[email: grabher@giub.uni-bonn.de]