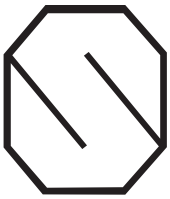
Temporary Architectures of Learning: Knowledge Governance in Project Ecologies

Gernot Grabher

Organization Studies 2004; 25; 1491
DOI: 10.1177/0170840604047996



Temporary Architectures of Learning: Knowledge Governance in Project Ecologies

Gernot Grabher

Abstract

This paper is motivated by the intention to contribute to a contextual understanding of projects. More specifically, the analysis starts from the assumption that essential processes of creating and sedimenting knowledge accrue at the interface between projects and the organizations, communities, and networks in and through which projects operate. By adopting such a contextual perspective, the chief aim of the present study is to unfold a conceptual framework for analyzing processes of project-based learning. This conceptual framework is built around the notion of the *project ecology*. By consecutively disentangling the constitutive layers of project ecologies — the core team, the firm, the epistemic community, and the personal networks — the basic organizational architecture of project ecologies is revealed. This architecture is employed as a theoretical template for an exploration of learning processes in two ecologies which are driven by opposing logics of creating and sedimenting knowledge. In this comparative analysis, the cumulative learning logic of the software ecology in Munich is confronted with the disruptive learning regime in the London advertising ecology.

Keywords: project ecology, project context, project-based learning, software, advertising

Gernot Grabher
University of Bonn, Germany

Introduction

Towards a Contextual View of Projects

Projects are cool, it seems. In contrast to the long-established and rather rigid institution of the firm, temporary projects allow a most flexible and task-specific allocation of resources. Through their transience and radical task-orientation they hold the promise of a hyper-efficient organizational form freed from any organizational slack (see Lash and Urry 1994: 124). More recently, moreover, projects have come to be seen as heralding a secular transformation in the mode of knowledge creation. In this view, projects epitomize a shift of the locus of knowledge creation from the traditional (science-pushed) institutional framework to knowledge creation in the *context of its application* (Gibbons et al. 1994). Although this shift, at second glance, appears less radical than prophesied (see Amin and Cohendet 2004: 14), the single-task focus and temporal limitation of projects in fact privileges a

Organization Studies
25(9): 1491–1514
ISSN 0170–8406

DOI: 10.1177/0170840604047996

situative pragmatism: knowledge is valued according to its usefulness to solve the specific project task rather than to the authority of its disciplinary, institutional or departmental origin and status. Through their trans-disciplinarity and transience, projects thus indeed appear as a most pertinent form for *creating* knowledge in the context of application.

The temporal limitation, however, also causes a cardinal limitation of any transient organizational form in *sedimenting* knowledge. Knowledge that is accumulated in the course of a project is at risk of being dispersed as soon as the project team is dissolved and members are assigned to a different task, another team, a new deadline (DeFillippi and Arthur 1998). Due to the overarching focus on deadlines, the culture of project-based organizing symptomatically leaves hardly time to reflect on previous assignments (Hobday 2000; Brady and Davies 2003). Projects, viewed as singular ventures, combine diverse knowledges effectively; apparently, however, they also tend to forget quickly.

This notorious syndrome of 'organizational amnesia' has increasingly drawn the attention from the singular venture to the wider social context in which projects are embedded. In a contextual view, essential processes of creating and sedimenting knowledge are seen to arise at the interface between projects and the organizations, networks, and institutions in and through which projects operate (Scarbrough et al. 2003). This contextual view of project-based learning shares a basic assumption of a more recent strand of organizational research that rejects the conventional perception of projects as a phenomenon isolated from its history, stripped of its contemporary social and spatial context and independent of the future. Projects in this perspective rather are seen as inextricably interwoven with an organizational and social context which provides key resources of expertise, reputation, and legitimization (see Blomquist and Packendorff 1998; Ekstedt et al. 1999; Gann and Salter 2000; Brady and Davies 2003; Grabher 2002a; Sydow and Staber 2002; Engwall 2003).

The Architecture of Project Ecologies

By adopting a contextual understanding of projects, the prime intention of this paper is to develop a conceptual framework for analyzing project-based learning. This framework is built around the notion of the *project ecology* (Grabher 2002a, b, c, 2003). The paper will reveal the basic architecture of project ecologies by disentangling its constitutive layers, the core team, the firm, the epistemic community, and the personal networks.

In the paper's first section, the *core team* represents the basic organizational unit and the elementary learning arena of projects. It embodies temporal continuity and bears chief responsibility during the course of the entire project (DeFillippi and Arthur 1998). By subsequently moving from the core team to the *firm* (next section), the analysis shifts from the level of the individual project to learning processes that accrue from the management of portfolios of projects. By handling subsequent and related projects, firms in project ecologies thus acquire particular 'project capabilities' (Davies and Brady 2000).

The actual locus of project-based learning extends beyond the boundaries of the individual firm. The perforation of the firm boundaries, indeed, is an emblematic feature of project ecologies. Project-specific knowledge creation rather ensues in the *epistemic community* (third section). The epistemic community involves all project participants who contribute to the production of knowledge to accomplish the specific task, even if only temporarily and partially (see also Knorr Cetina 1981, 1999; Amin and Cohendet 2004: 75). Most importantly, they comprise clients and suppliers but increasingly also major corporate groups to which project ecologies become affiliated.

Core team, firm, and epistemic community represent the organizational layers that are temporarily tied together for the completion of a specific project. Beyond this manifest pattern of organizational networks, project ecologies also unfold a wider fabric of *personal networks* (following section) that endure and stretch out beyond the actual project (see also Wittel 2001). Although these more latent networks can be activated to solve project-specific problems, they typically remain in the project background and sustain ongoing learning processes of the individual project members (see also Starkey et al. 2000).

Contrasting Project Ecologies: Cumulative vs. Disruptive Learning Mode

By consecutively exploring and linking these four layers, the paper seeks to elucidate the conceptual framework by comparing two project ecologies that are driven by opposing logics of creating and sedimenting knowledge. This juxtaposition refers less to the learning outcomes but rather focusses on the different learning processes and organizational practices prevailing in each ecology.

The key imperative in the first ecology is the *modularization* of knowledge. Knowledge practices in this mode 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 the basis of learning. Project organizing is geared towards moving from the singular one-off venture to repeatable solutions (see also Davis and Brady 2000; Brady and Davis 2003). This *cumulative* learning regime 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; Casper and Whitley 2002).

The logic of modularization will be juxtaposed with a learning mode that is organized around the imperative of *originality*. Although, of course, learning by repetition also plays an important role, learning by switching ties both within and across organizations signifies the characteristic knowledge practice in this ecology. Whereas the former learning regime 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 ecology epitomizes the workings of such a *disruptive* learning regime. London during the late 1980s had emancipated itself from the hegemonic US industry through a new style of organizing production which made London a prime center of creative advertising (Lash and Urry 1994: 138–142; Grabher 2001).

Research Setting and Method

The basic idea of the project ecology has been developed in the course of a longitudinal empirical study of project-based organizing in the London advertising industry. The exploratory fieldwork of this study was conducted in spring 1998, summer 2000, and summer 2002 in central London. In total, 78 semi-structured interviews (with an average duration of 120 minutes) in advertising agencies (mostly with account managers, to a lesser extent with account planners and art directors) and with key management personnel of collaborating film- and post-production companies were conducted.

The research process was iterative with the first series of rather open interviews focussing on the internal organization of projects and subsequently investigating the contextual factors of projects more systematically. All interviews were taped and transcribed verbatim. First-hand information was supplemented by a variety of secondary sources including interviews with representatives of the Institute of Practitioners in Advertising (IPA) and the Account Planning Group (APG) and data from industry reports, trade press (Ad Age, Campaign), business reports, and press releases. By using inductive qualitative techniques to analyze the data (Eisenhardt 1989), the findings of this longitudinal study were aggregated and synthesized in a first conceptualization of the notion of the project ecology (Grabher 2002a, b, 2003).

Based on this elaboration of the *internal workings* of a single project ecology the conceptual framework elaborated in this paper in addition draws on ongoing research that seeks to systematically examine *different types* of project ecologies. This research provides the empirical material on the software ecology that has been gathered in 36 semi-structured interviews (with an average duration of 90 minutes) in Munich software firms (mostly with project managers and key management personnel) between spring and summer 2003 by the author and Oliver Ibert. These interviews were also taped and transcribed verbatim. The inductive analysis of these data not only revealed striking differences between both ecologies along the dimensions that had been derived from the previous research on advertising, but in addition, alerted us to further features of project ecologies. Most importantly, the research on the Munich software ecology drew attention to a variety of latent personal networks that evolve in the project background. This finding motivated a (selective) re-examination of the data on the advertising ecology to elaborate different types of personal networks more systematically and to revise the initial conception of project ecologies considerably.

The chief aim of this paper thus is neither to provide in-depth idiographic accounts of the local clusters in Munich and London nor aimed at an exhaustive sectoral analysis of the software and advertising businesses. At

issue rather is an empirically grounded conceptualization (see Glaser and Strauss 1967) of the architecture of project ecologies. The paper thus occasionally risks brushing over nuances and idiosyncracies of the empirical cases for the sake of the consistency and usefulness of a conceptual template for studying project-based learning in different settings.

The Core Team: Reducing vs. Preserving Cognitive Distance

The core team epitomizes temporal continuity and accountability (DeFillippi and Arthur 1998) and typifies the elementary learning arena. Abstracting from the idiosyncrasies of the production process, core teams in the London advertising and the Munich software ecology comprise a set of professional profiles and skills that share 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. The client-specific tasks, demands, and expectations have 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 organizational coordinates within which the *professional logic* of the expert knowledge can unfold.

These generic imperatives of project organizing are embodied in and balanced by different trade-specific professional profiles and occupations (on software, see Ibert 2004; Beer 2003: 31; on advertising, see Wells et al. 1998; Nov and Jones 2003). Each professional profile signifies a specific work ethos and perspective which implies a certain 'cognitive distance' between these professions (see Nooteboom 2000). Meaningful interaction and fruitful collaboration across cognitive distance, of course, is 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. Whereas the interactions and practices of the core team in the software ecology are geared towards *reducing* cognitive distance, project organizing in advertising rather is aimed at *preserving* cognitive distance.

The organizational repertoire to reduce cognitive distance in the software ecology comprises a range of organizational practices and conventions. Firstly, 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: candidates with graduate degrees in engineering and technology (in a broad range of disciplines) typically are selected by firms for a broad array of jobs and roles. Secondly, the composition of core teams characteristically remains stable over several project cycles. Collaboration within the team thus evolves from an interaction between strict professional roles into relationships between acquainted

colleagues. Collaboration in the project, generally, seems more strongly molded by the service-logic of *joint* problem solving than by the particular professional ethos. The predominant collaborative ethos thus harshly clashes with the cliché of the red-eyed, antisocial coder hidden in a silent cubicle (see also Lannes 2003: 329).

In the advertising ecology, in contrast, professional identities crystallize into 'creeds' whose distinctiveness is reiterated through organizational practices, professional styles, and distinct dress and language codes (Grabher 2002b: 248; see also Bilton and Leary 2002: 56–57). Professionals hardly change roles within the core team (if they change role it is rather switching from the agency to the client side of the business; see also Alvesson 2000: 1109). Although professionals are recruited from a broad range of educational and biographical backgrounds, further training appears more discriminating between different occupations since it is provided by professional associations (like the Account Planning Group) rather than by individual agencies.

Moreover, the personal composition of teams is deliberately altered from time to time to trigger novel and unexpected confrontations of different perspectives. Interactions within the team are, comparatively speaking, more strongly shaped by antagonistic professional identities than by the joint project task. For creative individuals, for example, market researchers and strategic planners in the core team notoriously represent a continuous assault of 'testing down every single idea' of their genuine creation, a permanent restriction of their imagination, and inspiration by those 'who lack passion for advertising' (Shelbourne and Baskin 1998: 78). Creative sparks ignite, as the business mantra goes, in this rivalry between strong professional identities.

The Firm: Economies of Repetition vs. Economies of Recombination

Economies of Repetition: Tools, Cultures, Stories

Despite the extensive projectification of production, the project ecology of software as well as of advertising is also, and quite obviously, populated by firms. Firms sustain ongoing and repetitive business processes that are instrumental in managing project portfolios (Gann and Salter 2000). By handling a range of consecutive and related projects, firms in both ecologies in fact aim at enhancing and accumulating particular 'project capabilities' (Davies and Brady 2000; Brady and Davies 2003).

In both ecologies firm-specific best practice is codified in *tools* which align collective effort by providing menus for risk assessment, costing, project design, scheduling, and contractual agreements (see also Orlikowski 2002: 260–262). Moreover, firms aim at reinforcing and extending the reach of codified tools with (less codified) *culture*. Corporate culture in both trades is colored by idiosyncratic personal constellations, less visible in the software ecology but much more palpable in the advertising ecology around the 'stars' and agency founders (after whom, symptomatically, agencies are named).

Whereas cultures in the software environment are strongly molded by the culture of client industries, the cultures in advertising are reflecting 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 successes (or legendary flops) 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: Modules, Products

While in both ecologies project-to-project and project-to-business learning allows 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).

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. 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 and ease of modification) and/or 'variability' of code (by boosting adaptability to different application contexts).

In the Munich ecology, organizational routines to systematically reuse components seem largely confined to the library model (in which centralized repositories of components are set up) and, in a few exceptions, simple versions of a curator model (where the specialists of managing repositories of components are also assigned a quality certification role; see also 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 who specialize in products, projects remain of vital importance. Projects provide crucial learning opportunities to refine products or to broaden the domain of their applicability (see Fichman and Kemerer 2001). Projects, in other words, are the R&D laboratories of firms who specialize in products.

The logic of reusing knowledge on the level of the product seems diametrically opposed to the overarching imperative of freshness in the advertising ecology. The quintessential demand for originality limits the scope for reuse

and modularity on the level of the creative product to a minimum, at least in principle (see also Wells et al. 1998). Although agencies seek to differentiate themselves from their main competitors through a particular esthetic and a specific 'way of doing things', they somewhat paradoxically also desperately endeavor to avoid a particular 'house style'. The aim is to be distinct and yet not predictable since this would inevitably limit the market.

Epistemic Community vs. Epistemic Collective: Clients, Suppliers, Corporate Groups

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 fulfill the project goal (see Cowan et al. 2000). 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 member to the cognitive goal with regard to the criteria set by the procedural authority (Amin and Cohendet 2004: 75).

This understanding of epistemic communities might, indeed, more aptly depict organizational practices in the cumulative learning regime in which enduring and close ties prevail. The very notion of the 'community', however, evokes a sense of persistence, coherence, and harmony that not only seems absent but even not desired in the originality-fixated advertising ecology: instead of a collaborative ethos, individual creativity enjoys, or at least strives for, unchallenged primacy. The rivalry in the antagonistic learning practices and transience of ties in the disruptive learning regime might more appropriately be termed *epistemic collective* (see also Lindkvist 2003; Swan et al. 2002: 482–484). Although the antagonistic practices and short project cycles prevent epistemic collectives from evolving into coherent communities, they of course are nevertheless sufficiently aligned through the project task and deadlines, as a managing director of a London agency illustrates:

> 'I always say to our clients: don't worry, it looks like a mess ... chaos and anarchy ... we think we need it. Moving around, being crazy ... that's all fine, because we know we've got to deliver on time. There are deadlines, we have to be on TV, on poster.'

Notwithstanding their different social logics, epistemic communities as well as collectives in both ecologies extend beyond the firm to involve the same set of actors, that is, clients, suppliers, and corporate groups.

Clients: Technical vs. Personal Lock-in

In both ecologies clients 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, it's the *account* and not the *project* manager in advertising). In both contexts, projects thus are strongly conceived as strategic pivots from which to leverage a continuous stream of business. 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.

In the Munich software ecology, user participation appears particularly deep (see Lehrer 2000: 592). Software projects frequently are carried out on-site in ongoing conversation with the IT units as well as the end-users in the client's organization (Beer 2003). By embracing the client into the simultaneous engineering of different project teams, the discursive pragmatics of 'collaborative engineering' unfold (Neff and Stark 2003). The client's expectations, although specified in the brief, typically crystallize into more concrete specifications not before the project process has yielded some interim variants. 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 software platforms.

Even within shorter project cycles and despite elaborate 'change-control' tools (Lannes 2003: 336–337) project specifications as a consequence are 'racketing up' (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. It also opens 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 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 coordinates 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 seems more limited and 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 colored (quite literally) by individual taste and esthetic preferences, trust in the (style) expert's judgment is of considerable value.

Trust does not equal involvement, however. On the contrary, high levels of trust afford lower degrees of controlling the creative process. Trust, among others, is nurtured through a practice that in advertising is referred to as 'educating clients' (Grabher 2002b: 250). This practice encompasses, besides agreeing on basic esthetic standards, clarifying the division of labor 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 'legacy systems', client participation in advertising is limited by the creative ethos that demands at least temporary independence from the interference of clients who characteristically associate creativity with risk (see also Shelbourne and Baskin 1998).

Suppliers: Orchestration vs. Improvisation

The different degrees of client involvement correspond with inverted roles of suppliers, i.e. the higher degree of client involvement corresponds with a relatively 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 implementation, smaller, projects-only specialists seem to prefer in-house solutions vis-a-vis extended supplier networks. In fact, freelancing typically is 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 modularization of projects as well as the analytical professional ethos favor a partition of jobs among project collaborators that resembles *orchestration* in the sense of a comparatively clear assignment of responsibilities and exact timing. Due to the size and technical complexities of projects (see also Fichman and Kemerer 2001: 58), a high premium is again placed on continuity. Long-term collaboration with a relatively stable set of suppliers additionally, 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.

In the advertising ecology the participation of technical specialists follows similar principles of hierarchical synchronization and modularization of tasks. The collaboration with creative professionals, though, involves turbulence, ambiguity, and ongoing 'redistribution of improvisation rights' (Weick 1998: 549). The methodological ethos in the software ecology stands out against a creative culture epitomized in the refrain: 'as long as the show was on time, it was not important how it was achieved' (Hartmann et al. 1998: 272).

Collaboration with creative suppliers mimics features of (jazz) *improvisation*, a 'prototype organization' designed to maximize innovation (see Hatch 1999). Improvisation, essentially, implies a deliberate interruption of

habit patterns and a rotation of 'leadership' during the performance. In the same way as jazz bands vary their composition of players, ties of agencies with suppliers are reconfigured from time to time around a relatively stable set of core relationships. This variance in composition reflects, on the one hand, the demand for a project-specific set of skills; on the other hand, collaborative ties with suppliers are also deliberately interrupted or terminated for the sake of freshness, as a London art director elucidates: "You work with your favorites ... but you also try new people, because of new ideas, new approaches ... you look for freshness" (see also Grabher 2001: 367–369).

Corporate Groups: Product vs. Client-Centered Affiliation

The knowledge practices, more and more, are molded by the corporate groups to which both ecologies increasingly become tied into. In the software ecology the importance of corporate groups is immediately obvious through the presence of truly global software brand names like SAP, Oracle or Siemens. Beyond direct ownership, smaller firms are often tied to corporate groups through license agreements. These arrangements, in their more visible dimension, primarily refer to the client-specific adaptation of the product portfolio of the large corporations in the context of recurrent projects.

License agreements typically aim at generating cycles of learning or, at least, sporadic feedback from the frontline of application projects to the refinement of corporate tools and the further evolution of the product portfolio. This continuous inflow of corporate methods, standards, and tools thereby yields some positive reputation effects in the software ecology, in which the label 'Oracle approved', for example, facilitates access to clients.

The significance of the large corporate domain in the advertising ecology is far less perceptible (and deliberately so). Since affiliation of London agencies with the three leading global communication groups, Interpublic, Omnicom, and WPP (see also Nachum and Keeble 2000), often is limited to financial control, these ownership links provide only comparatively narrow channels through which corporate tools and cultures diffuse into the ecology and project experience is fed back into the corporate group. Although corporate groups, like WPP for example, set up 'knowledge communities' which share non-confidential insights and case study evidence (WPP Group Navigator 2002), the scope for post- and cross-project learning within the corporate network is considerably smaller, not least due to the pronounced variety of (agency) cultures within these groups.

Whereas the corporate groups in software crystallize primarily around products, they evolve around clients in the advertising ecology. The key rationale of corporate groups in advertising is to provide clients with a 'one-stop' service on a global scale and in a cross-disciplinary fashion including the entire spectrum of communication services, ranging from classical advertising to direct marketing, sponsorship, PR to design service (see, for example, WPP *Annual Report and Accounts 2002*). For software firms the involvement with a group extends both the range of modules and the portfolio

of skills. For advertising agencies group affiliation only broadens the spectrum of skills from which to compose core teams since the transfer of modules within the corporate group is restricted by the imperative of originality.

Although the backing of a corporate group facilitates the acquisition of global clients, the association with a 'Wall Street behemoth' degrades creative reputation conspicuously. For the creatives, the 'hearts', the efficiency-driven manuals and standardized corporate toolkits inevitably thwart the creative process which demands distance not only from client interference but also from the uniform corporate principles of the 'suits' (see also Shelbourne and Baskin 1998).

Personal Networks: Communality and Connectivity vs. Sociality

Epistemic communities and collectives are built around actual organizational networks that represent the 'plumbing' of the project ecologies (see also Podolny 2001; Owen-Smith and Powell 2004). Each project prompts a reconfiguration (in software, to a minor degree, in advertising, to a significant extent) of the 'pipes' through which resources are conveyed to achieve the specific project aim. Project ecologies also comprise personal networks that endure and stretch out beyond the manifest pattern of the actual production networks. *Networking*, in fact, signifies the emblematic practice in project ecologies (see also Wittel 2001). The more latent personal ties can be activated to solve specific problems in the actual project (Starkey et al. 2000). More typically, though, they remain in the project background and provide lasting support for the individual members in both ecologies in multiple ways.

In both ecologies project members seem to rely on personal networks that systematically differ with respect to their governance principle and their architectures. The proposed differentiation of network types reflects, on a most general level, different degrees of social embeddedness (Granovetter 1985) as indicated by the multiplexity of ties (see Uzzi 1997; Uzzi and Gillespie 2002). While network communality intricately interweaves private with professional dimensions of social exchange (high multiplexity) and network sociality is dominated by professional agendas that are merely underpinned by private aspects, network connectivity is almost exclusively professionally oriented (low multiplexity). These network types, of course, neither signify 'arithmomorphic' concepts with sharp boundaries nor do they remain unchanged over several project cycles. In fact, they typically overlap and alter their character over time, i.e. gain or lose multiplexity in the course of repeated collaboration. Nevertheless this classification is employed as an intellectual strategy to systematize empirical observations and direct further theoretical imaginations on diffuse learning processes in latent personal ties of project ecologies (see Table 1).

Table 1.
Personal Networks

	Communality	Sociality	Connectivity
	Software	*Advertising*	*Software*
Nature of ties	Lasting, intense	Ephemeral, intense	Ephemeral, weak
Basis of ties	Common history	Professional complementarity	Common interest
Social realm	Private cum professional	Professional cum private	Professional
Governance	Trust	Networked reputation	Professional ethos
Focus	Relationship-oriented	Career-oriented	Task-oriented
Contents	Experience	Know-whom	Know-how

Communality: Exchanging Experience

The notion of communality denotes robust and thick ties that are firmly rooted in personal familiarity and social coherence. Although communality is present in both ecologies, it appears of markedly 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 school, (confessional) youth organizations, university or with long-term work-mates are disrupted by inter-firm and inter-regional mobility.

The duration of 'linear time' (Sennett 1998; see also Bauman 1996: 51) in the social realm of communality engenders the evolution of personalized experience-based trust as the chief governance principle. Communality, suggestive of the classical notion of *Gemeinschaft* (Tönnies 1979), is built around a robust architecture based on common personal experience that limits the number of relationships (see also Granovetter 1985; Uzzi 1997), characteristically to between three and six ties in the Munich ecology. The strength of personal ties in communality, of course, does not necessarily imply high frequency of interactions. On the contrary, these networks typically can remain dormant over long periods of time and can be reactivated without much social effort.

Since communality is rooted in social coherence rather than in professional identity, the scope for project-specific support is naturally rather limited. Rather, network communality typically provides backing in dealing with personal issues when these ties, for example, are used as a sounding board for contemplating career decisions or discussing conflicts within the core team. Communality, in short, primarily conveys personal experience beyond the day-to-day project frenzy rather than specific information.

Sociality: Acquiring Know-Whom

In contrast to the strong and lasting relations in communality, the notion of sociality emphasizes ephemeral, yet intense, networking that is primarily driven by professional motivations (Wittel 2001: 51). 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. Whereas communality evolves through stability and long-term commitments, sociality is driven by the canonical compulsion of mobility and flexibility. 'Linear time' in communality is thus partitioned into 'serial time' (Sennett 1998) defined by cycles of (comparatively shorter) 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 essentially relies on 'networked reputation' (Glückler and Armbruster 2003) as a chief governing principle. In the absence of personal experience with a particular person or firm, project members rely on word-of-mouth judgments of friends or trusted collaborators. Although less reliable than personal experience, networked reputation conveys a far more personal and dependable credibility than public reputation that circulates freely in the project ecology (Glückler and Armbruster 2003: 280; see also Granovetter 1985: 490).

While networks in communality are firmly founded on the coherence in the private realm, the more complex and extended architecture of network sociality is primarily constructed around professional complementarity. Sociality comprises relationships with practitioners who, potentially, *could* complement a core team or a supplier network in a future project. Since the private dimension of these ties (such as personal sympathy, affinity to certain hobbies or joint acquaintances) typically remains superficial, sociality is less limited than communality and involves several dozen to a few hundred ties. Despite the obvious transience the private facets of ties is seen as instrumental for easing professional agendas. Work here 'appears to supplant, indeed hijack, the realm of the social' (McRobbie 2002: 99). In fact, the more strategic approach towards relationships is suggestive of an outright commodification of networks (Wittel 2001: 56): contacts with blue-chip clients or in-vogue creatives are 'stored', 'exchanged' and — as trade parlance reveals — even 'stolen'.

The strategic dimension of networking is brazenly exposed in a statement from a co-organizer of networking events (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)

In the disruptive learning regime sociality fulfills indispensable functions. Most importantly, sociality provides critical information of job opportunities

for the nomadic project worker as well as on pending accounts, forthcoming pitches, and available cooperation partners (see also Jones 1996; DeFillippi and Arthur 1998; Ekinsmyth 2002). In this sense, sociality is less 'narrational' than communality but rather focussed on 'catching up' (see also Kotamraju 2002). Catching up, though, is not confined to information on mere availability but also refers to generic project skills like reliability and stress tolerance (which, of course, are not certified in university degrees). Sociality thus allows the accumulation of 'know-whom', which embodies critical component of the 'tacit knowledge' that is imperative to navigate through a fluid project ecology (Gann and Salter 2000: 969).

Connectivity: Upgrading Know-How

The concept of connectivity denotes the socially thinnest and culturally most neutral, in a sense, the most weakly embedded mode of networking. Whereas communality amalgamates friendship and professional issues, and sociality more strategically supports business agendas with private facets, communication in connectivity is relatively distant from the personal realm and most succinctly focusses on the specific subject matter of projects. Social relations are almost purely informational. As much the cause as the result of the low level of social embeddedness, connectivity primarily unfolds in virtual forms of interaction while communality and sociality represent predominantly 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 preponderates. In addition, despite the availability of increasing bandwidth in virtual communication, the color tone in the proofs, like the sensual quality of the paper for the brochure, 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 or mailing lists owing to the cultural neutrality and asynchronicity of these media (*Computerworld*, 8 December 1997).

These virtual and ephemeral forms of exchange hardly seem to engender personalized trust nor do they unfold the dynamics of networked reputation (see also English-Lueck et al. 2002). Nevertheless, online forums depend on a sort of generalized reciprocity to preserve virtual sources, like collective knowledge on software, from an imbalance between too little nourishing and over-utilization that increasingly undermines the value of the source (Kollock 1999). Virtual collective knowledge sources, phrased differently, require institutional safeguards to elude the 'tragedy of the (virtual) commons'. Under conditions of (close to) anonymous exchange, connectivity instead seems to be governed by the professional norms and ethos prevailing in the software ecology. Reflecting the general affinity towards reusing knowledge, the software ecology is strongly molded by an ethos of collaborative problem solving and mutual backing (see also Orlikowski 2002: 264; Brenner 2003).

Despite the vast extension of the ties, the architecture follows a straightforward construction principle: participation is bound to a certain level of

expertise which allows meaningful interaction with other participants. Whereas communality is rooted in a common private history, connectivity is based on a common interest (see also Shumar and Renninger 2002: 6). The far-reaching connectivity complements the restricted communality in the software ecology. While communality provides a sounding board for conveying personal experience beyond the specific project, connectivity yields essential continuing learning processes related to the substance matter of software projects, that is, coding.

First, particularly in the context of open-source code like Linux, connectivity provides a virtual construction site where code is updated, modified, and repaired, that is, a place where software developers do the actual programming work. Second, and on a far more widespread level, connectivity is a most effective vehicle for upgrading and reformatting software skills (see Kotamraju 2002: 16–18). Since the continuous upgrading of skills through reciprocal problem solving is firmly rooted in everyday practice it delivers immediate usability that is unattainable through formalized training programs. By stretching out far beyond the knowledge range of the core team and firm, connectivity thus opens up a wide horizon for a continuous further (self-)education and the upgrading of the individual know-how basis (see also Brenner 2003).

Summary: Towards a Typology of Project Ecologies

Inspired by a contextual perspective on projects (see Blomquist and Packendorff 1998; Ekstedt et al. 1999; Gann and Salter 2000; Brady and Davies 2003; Grabher 2002a; Sydow and Staber 2002; Engwall 2003; Scarbrough et al. 2003), this paper set out to unfold a conceptual framework for analyzing processes of project-based learning. This framework has been built around the notion of the *project ecology* (Grabher 2002a, b, c, 2003). By consecutively probing into the constitutive layers of project ecologies — the core team, the firm, the epistemic community, and the personal networks — the basic organizational architecture of project ecologies was revealed. The architecture provided the theoretical template for an exploration of learning processes in two ecologies which are driven by opposing logics of creating and sedimenting knowledge. In this comparative analysis, the *cumulative* learning logic of the software ecology in Munich has been compared with the *disruptive* learning regime in the London advertising ecology (see Table 2).

Starting with the basic organizational layer of the project ecology, the *core team* represents the elementary learning arena. Whereas the software ecology seeks to facilitate cumulative learning through the cohesion of the core team, the advertising ecology cultivates rivalries and maintains cognitive distance between team members to trigger creativity. By subsequently moving from the core team to the *firm*, the analysis shifted from learning in the individual project to learning that accrues from the management of project portfolios. In both ecologies firms reap ‘economies of repetition’ (Davies and Brady 2000) by transferring lessons from individual projects into a firm-specific set

Table 2. Synoptic Comparison

Cumulative learning *Software*	**Disruptive learning** *Advertising*
Core team Reducing cognitive distance Switching roles Stable teams	**Core team** Preserving cognitive distance Stable roles Switching teams
Firm *Economies of repetition* Tools, culture, stories *Economies of recombination* Modules, products	**Firm** *Economies of repetition* Culture, stories, tools *Economies of recombination* —
Epistemic community *Clients* Projects with clients Technical lock-in *Suppliers* Orchestration Never change a winning team *Corporate groups* Product-centered Portfolio of skills and modules	**Epistemic collective** *Clients* Projects for clients Personal lock-in *Suppliers* Improvisation Always change a winning team *Corporate groups* Client-centered Portfolio of skills
Personal networks *Communality* Experience *Connectivity* Know-how	**Personal networks** *Sociality* Know-whom

of organizational tools, a distinctive culture and a repertoire of stories. The software ecology, though, in addition benefits from 'economies of recombination' that arise from accumulating knowledge into modules that can efficiently be recombined in subsequent projects.

The actual locus of project-specific knowledge production in both ecologies is the *epistemic community* that extends beyond the firm and involves clients, suppliers, and global corporate groups. Reflecting the different degrees of client involvement, projects in the software ecology might more aptly be described as being performed *with* the client, whereas advertising projects are closer to being realized *for* the client (see Girard and Stark 2002). On the level of supplier relations, the contrasting learning logics play out as the opposition between the commonsense '*never* change a winning team' in software and the challenge to '*always* change a winning team' (see Mayer 2002) for the sake of freshness, in advertising. The increasing affiliation with global corporate groups implies for the software ecology a widening of the portfolio of modules and skills, whereas group affiliation for the advertising ecology basically broadens the spectrum of skills from which to compose core teams.

Core team, firm, and epistemic community represent organizational layers that are temporarily tied together for the completion of a specific project.

Beyond these actual organizational networks, ecologies also unfold a wide and latent fabric of *personal networks*. In the software ecology, the cumulative learning mode translates on the one hand into dense, though constrained webs of lasting and intense ties ('communality') for the exchange of personal experience; on the other hand, the continuous upgrading of skills and exchange of specific know-how occurs in socially thin and vast virtual networks ('connectivity'). The disruptive learning regime of the advertising ecology, in contrast, favors ephemeral, yet intense variants of networks ('sociality'). Sociality, suggestive of a commodification of networks, is instrumental for building up know-whom.

In both ecologies, however, the constitutive organizational layers do not only afford distinctive dynamics of creating and sedimenting knowledge (as revealed by reading Table 2, line by line). Moreover, the two ecologies differ qualitatively with regard to the relative weight and specific role of the individual layers in the overall architecture of each (as a column by column reading of Table 2 suggests). The qualitative differences between the architectures primarily refer to the sedimentation of knowledge. Although practices to curb the notorious amnesia of project-based organizing are ingrained in all layers, the firm appears to play a more significant role for knowledge sedimentation in the software ecology. The firm is not only a prime locus of accumulating generic project capabilities, it also embodies a chief repository of specific project know-how that is sedimented in modules and products. The firm thus embodies key memory functions in the software ecology.

In the advertising ecology, in contrast, the firm primarily functions as repository of project capabilities whereas the prevailing imperative of originality limits the scope for modularization of project knowledge. In addition, network sociality provides a distributed repository for the know-whom that is indispensable for the relentless rewiring of ties and recombination of teams. In this sense, the repositories of knowledge in the advertising ecology are located in both the firm and the personal networks.

These two types of project ecologies, of course, neither represent the entire spectrum of architectures, nor do they signify the opposite poles of such a spectrum of configurations. The ecologies examined in this study, however, would suggest a categorization that stretches from *'firm-based'* (similar to software) through *'firm- and network-based'* (close to advertising) to *'network-based'* ecologies. Movie production, at first glance, appears as a potential candidate for the category of the 'network-based' ecology. The role of the firm in this latter type of ecology typically is reduced to a temporary shelf that provides the legal statute for episodically recombined collaborative networks (see, for example, Jones 1996; DeFillippi and Arthur 1998: 126; Sydow and Staber 2002). This rather coarse-grained categorization of project ecologies into the three types of 'firm-based', 'firm- and network-based', and 'network' based, of course, would have to be substantiated in future research.

Epilogue: The Case for Exploring Project Ecologies

At least three more general observations would endorse such an endeavor to explore different types of project ecologies and, in other words, to further exploit the notion of the *ecology*. Firstly, contextual views on organizing have a tendency to privilege, implicitly at least, a one-directional influence of the institutional context onto organizations. In these perspectives, the context remains as an externally given a priori. The notion of the project ecology, similarly to structurationist perspectives (see, for example, Sydow and Staber 2002), puts the accent on the recursive co-production and mutual configuration of project and ecology. Collaboration in projects, for example, might engender a personal network that subsequently provides the basis for a core team in which a follow-up project is anchored. Personal networks, in a sense are both, context *and* project. The intricate concoction of core team, firm, epistemic community, and personal networks thus repudiates any straightforward categorization into the static dualism of project and context.

Secondly, the concept of the project ecology accentuates diversity. The notion of the project ecology not only denotes a diverse ensemble of organizations, communities, and personal networks. Indeed, it also signifies a diverse ecology of professional ethos, social logics, organizational principles, and cultures. By deliberately embracing such diversity, the concept of the project ecology is also sensitive to internal tensions and conflicts. Instead of constructing the layers of the ecologies exclusively in terms of neat complementarities, the analytical framework offered here accommodates incoherence. Symptomatically, for example, individual project participants are faced with the challenge of aligning their conflicting loyalties to the core team, the firm, the client, and their personal networks (see, for example, Alvesson 2000; Swart et al. 2003). Moreover, the attempts at reuse in the software ecology jeopardize the distinctive features and comparative organizational advantages of projects, i.e. speed, focus on the client's problem, and task-specific allocation of resources. Economies of recombination, in other words, have to be permanently balanced against *dis*economies of recombination. Conversely, as much as the cognitive distance and rivalry within the core teams of the advertising ecology propels creativity it undermines the identification with the joint project task which is critical for the overall success of the venture. A more systematic appreciation of these tensions, inconsistencies, and paradoxes would set the idea of the project ecology even further apart from functionalistic approaches revolving around 'best practice' and critical factors for 'successful' project management.

Finally, the notion of the project ecology seeks to embrace the less obvious, though not necessarily less essential, latent dimension of project-based organizing. Beyond the 'plumbing' of ties fit together for a specific venture, project ecologies engender a diffuse sphere of networks that outlast the particular project (see also Starkey et al. 2000). By embracing a range of latent ties, the notion of project ecologies thus, on the one hand, elucidates that networks here not only function as 'pipes' through which resources are conveyed but also as 'prisms' through which other members of the ecology

are observed and assessed (see Podolny 2001). On the other hand, these latent networks epitomize potentiality (see Wittel 2001: 71), they sustain contacts to potential future collaborators, and keep open information channels that potentially provide access to upcoming project opportunities. The notion of the project ecology, taken together, thus could afford a conceptual template that allows us to advance a less functionalist, more differentiated and dynamic understanding of project embeddedness.

Note

I am grateful to Oliver Ibert for reflections and to Katrin Klein-Hitpass for research assistance in the course of the project 'Production in Projects' funded by the Deutsche Forschungsgemeinschaft (DFG: GR 1913/3). I also owe sincere thanks to the participants in the sub-theme 'Project Organizations, Embeddedness and Repositories of Knowledge' of the EGOS Colloquium in Copenhagen, 3–5 July 2003, for an exciting discussion of an earlier version of this paper. Finally, I would like to extend my thanks to three anonymous referees and the editors of this Special Issue for their exceptionally substantive comments.

References

Alvesson, Mats
2000 'Social identity and the problem of loyalty in knowledge intensive companies'. *Journal of Management Studies* 37/8: 1101–1123.

Amin, Ash, and Patrick Cohendet
2004 *Architectures of knowledge: Firms, capabilities, and communities*. Oxford: Oxford University Press.

Bauman, Zygmunt
1996 'Morality in the age of contingency' in *Detraditionalization: Critical reflections on authority and identity*. Paul Heelas, Scott Lash and Paul Morris (eds), Oxford: Blackwell.

Beer, Johannes
2003 'Systemspezifikation' in *Softwaretechnik. Praxiswissen für Software-Ingenieure.* Johannes Siedersleben (ed.), 21–47. München: Hanser.

Bilton, Chris, and Ruth Leary
2002 'What can managers do for creativity? Brokering creativity in the creative industries'. *International Journal of Cultural Policy* 8/1: 49–64.

Blomquist, Tomas, and Johann Packendorff
1998 'Learning from renewal projects: Content, context and embeddedness' in *Projects as arenas for renewal and learning processes*. Rolf A. Lundin and Christophe Midler (eds). Boston, MA; Dordrecht; London: Kluwer Academic Publishers.

Bourque, Pierre, Robert Dupuis, Alain Abran, Johanna Moore, Leonard Tripp, and Sybille Wolff
2002 'Fundamental principles of software engineering: A journey'. *Journal of Systems and Software* 62: 59–70.

Brady, Tim, and Andrew Davies
2003 'Learning in project-based firms: From unique to repeatable solutions'. Paper presented at the 19th EGOS Colloquium, Copenhagen Business School, 3–5 July 2003.

Brenner, Chris
2003 'Learning communities in a learning region: The soft infrastructure of cross-firm learning networks in Silicon Valley'. *Environment and Planning A* 35: 1809–1830.

Brown, John Seely, and Paul Duguid
1991 'Organizational learning and communities of practice: Towards a unified view of working, learning, and innovation'. *Organization Science* 2/1: 40–57.

Brusoni, Stefano, and Andrea Prencipe
2001 'Unpacking the black box of modularity: Technology, product, and organisation'. *Industrial and Corporate Change* 10(1): 179–205.

Casper, Steven, and Richard Whitley
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.

Cowan, Robin, Paul A. David, and Dominique Foray
2000 'The explicit economics of knowledge codification and tacitness'. *Industrial and Corporate Change* 9/2: 212–253.

Davies, Andrew, and Tim Brady
2000 'Organizational capabilities and learning in complex product systems: Towards repeatable solutions'. *Research Policy* 29: 931–953.

DeFillippi, Robert J., and Michael B. Arthur
1998 'Paradox in project-based enterprise: The case of film making'. *California Management Review* 40/2: 125–138.

Eisenhardt, Kathleen M.
1989 'Building theories from case study research'. *Academy of Management Review* 14: 532–550.

Ekinsmyth, Carol
2002 'Project organization, embeddedness and risk in magazine publishing' in *Production in projects: Economic geographies of temporary collaboration*. Gernot Grabher (ed.), *Regional Studies Special Issue* 36/3: 229–245.

Ekstedt, Eskil, Rolf A. Lundin, Anders Söderholm, and Hans Wirdenius
1999 *Neo-industrial organizing: Renewal by action and knowledge in a project-intensive economy*. London: Routledge.

English-Lueck, Jan A., Charles N. Darrah, and Andrea Saveri
2002 'Trusting strangers: Work relationships in four high-tech communities'. *Information, Communication & Society* 5/1: 90–108.

Engwall, Mats
2003 'No project is an island: Linking projects to history and context'. *Research Policy* 32: 789–808.

Fichman, Robert G., and Chris F. Kemerer
2001 'Incentive compatibility and systematic software reuse'. *The Journal of Systems and Software* 57: 45–60.

Gann, David M., and Ammon J. Salter
2000 'Innovation in project-based, service enhanced firms: The construction of complex products and systems'. *Research Policy* 29: 955–972.

Gibbons, Michael, Camille Limoges, Helga Nowotny, Simon Schwartzman, Peter Scott, and Martin Trow
1994 *The new production knowledge: The dynamics of science and research in contemporary societies.* London: Sage.

Girard, M., and D. Stark
2002 'Distributed intelligence and organizing diversity in new media projects' in *Fragile sector, robust practice: Project ecologies in new media.* Gernot Grabher (ed.), *Environment and Planning A Theme Issue*, 34/11: 1927–1949.

Glaser, Barney G., and Anselm L. Strauss
1967 *The discovery of grounded theory: Strategies for qualitative research*. New York: Aldine Publishing.

Glückler, Johannes, and Thomas Armbruster
2003 'Bridging uncertainty in management consulting: The mechanisms of trust and networked reputation'. *Organization Studies*, 24/2: 269–297.

Grabher, Gernot
2001 'Ecologies of creativity: The village, the group, and the heterarchic organisation of the British advertising industry'. *Environment and Planning A* 33: 351–374.

Grabher, Gernot
2002a 'Cool projects, boring institutions: Temporary collaboration in social context' in *Production in projects: Economic geographies of temporary collaboration.* Gernot Grabher (ed.), *Regional Studies Special Issue,* 36/3: 205–215.

Grabher, Gernot
2002b 'The project ecology of advertising: Tasks, talents and teams' in *Production in projects: Economic geographies of temporary collaboration.* Gernot Grabher (ed.), *Regional Studies Special Issue,* 36/3: 245–263

Grabher, Gernot
2002c 'Fragile sector, robust practice: Project ecologies in new media' in *Environment and Planning A Theme Issue.* Gernot Grabher (ed.), 34/11: 1903–2092.

Grabher, Gernot
2003 'Switching ties, recombining teams: Avoiding lock-in through project organization?' in *Rethinking regional innovation and change: Path dependency or regional breakthrough?* G. Fuchs and P. Shapira, P (eds). Boston, MA: Kluwer Academic Publishers.

Granovetter, Mark
1985 'Economic action and economic structure: The problem of embeddedness'. *American Journal of Sociology* 91/3: 481–510.

Hartmann, Francis, Rafi Ashrafi, and George Jergaes
1998 'Project management in the live entertainment industry: What is different?' *International Journal of Project Management* 16/5: 269–81.

Hatch, Mary Jo
1999 'Exploring the empty spaces of organizing: How improvisational jazz helps redescribe organizational structure'. *Organization Studies* 20/1: 75–100.

Hobday, Mike
2000 'The project-based organisation: An ideal form for management of complex products and systems?' *Research Policy* 29: 871–893.

Ibert, Oliver
2004 'Projects and firms as discordant complements. Organizational learning within the Munich software ecology'. *Research Policy* (forthcoming).

Ilvarasan, P. Vigneswara, and Arun Kumar Sharma
2003 'Is software work routinized? Some empirical observations from the Indian software industry'. *The Journal of Systems and Software* 66: 1–6.

Jones, Candace
1996 'Careers in project networks: The case of the film industry' in *The boundaryless career*. Michael B. Arthur and Denise M. Rousseau (eds), 58–75. Oxford: Oxford University Press.

Knorr Cetina, Karin
1981 *The manufacture of knowledge*. Oxford: Pergamon Press.

Knorr Cetina, Karin
1999 *Epistemic cultures: How the sciences make knowledge*. Cambridge: Cambridge University Press.

Kollock, Peter
1999 'The economics of online cooperation: Gifts and public goods in cyberspace' in *Communities in cyberspace.* Marc Smith and Peter Kollock (eds). London: Routledge.

Kotamraju, Nalini
2002 'Keeping up: Web design skill and the reinvented worker'. *Information, Communication & Society* 5/1: 1–26.

Lampel, Joseph, and Pushkar P. Jha
2003 'Reflective and genetic strategic learning in project-based organisations'. Paper presented at the 19th EGOS Colloquium, Copenhagen Business School, 3–5 July 2003.

Lannes, Andreas
2003 'Projektmanagement' in *Softwaretechnik. Praxiswissen für Software-Ingenieure.* Johannes Siedersleben (ed.), 321–342. München: Hanser.

Lash, Scott, and John Urry
1994 *Economies of signs and spaces*. London: Sage.

Lehrer, Mark
2000 'From factor of production to autonomous industry: The transformation of Germany's software sector'. *Vierteljahreshefte für Wirtschaftsforschung* 69/4: 587–600.

Lindkvist, Lars
2003 'Knowledge communities and knowledge collectivities. Different notions of group level epistemology'. Paper presented at the 19th EGOS Colloquium, Copenhagen Business School, 3–5 July 2003.

Mayer, Hans-Norbert
2002 'Mit Projekten planen. Empfehlungen über den Umgang mit einer neuen Planungsform'. Unpublished manuscript, University of Oldenburg.

McRobbie, Angela
2002 'From Holloway to Hollywood: Happiness at work in the new cultural economy' in *Cultural economy: Cultural analysis and commercial life*. Paul du Gay and Michael Pryke (eds), 97–114. London: Sage.

Nachum, Lilach, and David Keeble
2000 'Foreign and indigenous firms in the media cluster of central London'. ESRC Centre for Business Research, Working Paper 154, Cambridge University.

Neff, Gina, and David Stark
2003 'Permanently beta: Responsive organization in the Internet era' in *Society online: The Internet in context*. Philip E.N. Howard and Steve Jones (eds). Thousand Oaks, CA: Sage.

Nooteboom, Bart
2000 'Learning by interaction: Absorptive capacity, cognitive distance and governance'. *Journal of Management and Governance* 4: 69–92.

Nov, Oded, and Matthew Jones
2003 'Ordering creativity? Knowledge, creativity, and social interaction in the advertising industry'. Working Paper, Judge Institute of Management, Cambridge University.

Orlikowski, Wanda J.
2002 'Knowing in practice: Enacting a collective capability in distributed organizing'. *Organization Science* 13/3: 249–273.

Owen-Smith, Jason, and Walter W. Powell
2004 'Knowledge networks as channels and conduits: The effects of spillovers in the Boston biotechnology community'. *Organization Science* 15: 2–21.

Podolny, Joel M.
2001 'Networks as pipes and prisms of the market'. *American Journal of Sociology* 107: 33–60.

Scarbrough, Harry, Stéphane Laurent, Mike Bresnen, Linda Edelman, Sue Newell, and Jacky Swan
2003 'Developing the contextual view of project-based learning: Analysis of case-studies'. Paper presented at the 19th EGOS Colloquium, Copenhagen Business School, 3–5 July 2003.

Sennett, Richard
1998 *The corrosion of character: The personal consequences of work in the new capitalism*. New York: Norton.

Shelbourne, Jaspar, and Merry Baskin
1998 'The requirements for creativity: A director's perspective' in *How to plan advertising*. Alan Cooper (ed.), 64–80. London: Cassell/The Account Planning Group.

Shumar, Wesley, and K. Ann Renninger
2002 'On conceptualising community' in *Building virtual communities: Learning and change in cyberspace*. Wesley Shumar and K. Ann Renninger (eds), 1–17. Cambridge: Cambridge University Press.

Starkey, Ken, Christopher Barnatt, and Sue Tempest
2000 'Beyond networks and hierarchies: Latent organizations in the U.K. television industry'. *Organization Science* 11/3: 299–305.

Swan, Jacky, Harry Scarbrough, and Maxine Robertson
2002 'The construction of "communities of practice" in the management of innovation'. *Management Learning* 33/4: 477–496.

Swart, Juani, Nick Kinnie, and John Purcell
2003 'Managing the careers of IT professionals: A competing identity perspective'. Paper presented at the Academy of Management Meeting, Seattle, 1–6 August 2003.

Sydow, Jörg, and Udo Staber
2002 'The institutional embeddedness of project networks: The case of content production in German television' in *Production in projects: Economic geographies of temporary collaboration.* Gernot Grabher (ed.), *Regional Studies Special Issue* 36/3: 215–227.

Tönnies, Ferdinand
1979 *Gemeinschaft und Gesellschaft: Grundbegriffe der reinen Soziologie,* 8th edn. Darmstadt: Wissenschaftliche Buchgemeinschaft (first published 1887).

Uzzi, Brian
1997 'Social structure and competition in interfirm networks: The paradox of embeddedness'. *Administrative Science Quarterly* 42: 35–67.

Uzzi, Brian, and James J. Gillespie
2002 'Knowledge spillovers in corporate financing networks: Embeddedness and the firm's debt performance'. *Strategic Management Journal* 23/7: 595–618.

Weick, Karl E.
1998 'Improvisation as a mindset for organizational analysis'. *Organization Science* 9/5: 543–555.

Wells, William, John Burnett, and Sandra Moriarty
1998 *Advertising principles and practices*. Upper Saddle River, NJ: Prentice Hall.

Wittel, Andreas
2001 'Toward a network sociality'. *Theory, Culture & Society* 18/6: 51–76.

WPP Group
2002 *WPP Group Navigator* (corporate brochure).

Gernot Grabher Gernot Grabher is Professor of Economic Geography and Head of the Research Area Socio-Economics of Space at the University of Bonn. Previously he was Senior Research Fellow at the Wissenschaftszentrum Berlin, and Reader at King's College London. By interweaving economic sociology and economic geography he is currently interested in exploring the interdependencies between temporary and permanent forms of organization as well as between physical and virtual forms of interaction and knowledge exchange.
Address: Research Area Socio-Economics of Space, University of Bonn, Meckenheimer Allee 166, 53115 Bonn, Germany.
E-mail: grabher@giub.uni-bonn.de