THE OXFORD HANDBOOK OF

PROJECT MANAGEMENT

Edited by

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OXFORD
UNIVERSITY PRESS

OXFORD
UNIVERSITY PRESS

Great Clarendon Street, Oxford OX2 6DP

Oxford University Press is a department of the University of Oxford.
It furthers the University's objective of excellence in research, scholarship,
and education by publishing worldwide in

Oxford New York

Auckland Cape Town Dar es Salaam Hong Kong Karachi
Kuala Lumpur Madrid Melbourne Mexico City Nairobi
New Delhi Shanghai Taipei Toronto

With offices in

Argentina Austria Brazil Chile Czech Republic France Greece
Guatemala Hungary Italy Japan Poland Portugal Singapore
South Korea Switzerland Thailand Turkey Ukraine Vietnam

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in the UK and in certain other countries

Published in the United States
by Oxford University Press Inc., New York

First published 2011

British Library Cataloguing in Publication Data
Data available

Library of Congress Cataloging in Publication Data
Data available

Typeset by SPI Publisher Services, Pondicherry, India
Printed in Great Britain
on acid-free paper by
MPG Books Group, Bodmin and King's Lynn

ISBN 978–0–19–956314–2

1 3 5 7 9 10 8 6 4 2

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CHAPTER 7

PROJECT ECOLOGIES

A CONTEXTUAL VIEW ON TEMPORARY ORGANIZATIONS

GERNOT GRABHER
OLIVER IBERT

Introduction

Projects, it seems, are able to enact their own small worlds. As "temporary organizations" (Lundin and Söderholm 1995) and one-off ventures they appear as unique phenomena without predecessors or future perspectives. As goal-oriented organizations (Turner and Müller 2003) they evoke separate systems of relevance. Projects are strongly focused in scope and the involved actors are selected according to their contribution to the project's aims. Moreover, projects are from the outset well defined in terms of budget and other resources. These reiterated emphases on strict organizational boundaries and clear-cut distinctions between inside and outside have been suggestive to a perspective on temporary organizations which preferably concentrated on internal processes of project management.

More recently, though, a contextual view on projects (see Blomquist and Packendorff 1998; Ekstedt et al. 1999; Gann and Salter 2000; Grabher 2002a; Sydow and Staber 2002; Asheim 2002; Engwall 2003; Brady and Davies 2004; Söderlund 2004; Davies and Hobday 2005) has gained momentum, which problematizes the shortcomings of this conventional perspective. Instead of treating projects as

phenomena isolated from their history, stripped off their contemporary social and spatial context, and independent of the future, this literature highlights that temporary organizations continually interact with their wider context. For instance, aims and scope of a project have to be interpreted against the background of its stakeholders' history and future perspectives (Engwall 2003). Personal expertise needed in the course of a project is flexibly obtained from local labor markets (Jones 1996; DeFillippi and Arthur 1998). Project-based firms usually manage a whole portfolio of interrelated projects (Anell 2000), some of which compete for resources while others might cross-subsidize each other. Mutual trust, which is always at risk in a temporary organization, might be derived from common personal experiences gained in former collaboration but also on short notice from existing institutional settings and established professional standards ("swift trust"; Meyerson, Weick, and Kramer 1996).

The notion "project ecology" (Grabher 2002a, 2002b, 2002c, 2004a, 2004b; Grabher and Ibert 2006; Ibert 2004) provides a conceptual framework for analyzing projects from a contextual view. In short, project ecologies denote a relational space which affords the personal, organizational, and institutional resources for performing projects. This relational space encompasses social layers on multiple scales, from the micro level of interpersonal networks to the meso level of intra- and inter-organizational collaboration to the macro level of wider institutional settings. Moreover, it unfolds a complex geography, which explicitly is not reduced to local clusters but also extends to more distanced individuals and organizations or a-spatial institutions (DeFillippi and Arthur 1998; Grabher 2002b; Asheim 2002; Sapsed and Salter 2004; Grabher and Ibert 2006).

One of the main fields in which the contextual view generated new insights is the topic of project-based learning (Schwab and Miner 2008). Through their transdisciplinarity and transience, projects appear as a most pertinent form for creating knowledge in the context of application (Amin and Cohendet 2004). The temporal limitation of projects, however, also causes a cardinal limitation of any transient organizational form in sedimenting knowledge. Knowledge 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; Prencipe and Tell 2001). The overarching focus on deadlines hardly leaves time to reflect on previous assignments (Hobday 2000; Brady and Davies 2004).

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 (Hobday 2000; Prencipe and Tell 2001; Brady and Davies 2004; Sydow, Lindkvist, and DeFillippi 2004; Cacciatori 2008). 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;

Schwab and Miner 2008). This chapter reveals the multilayered architecture of project ecologies by consecutively disentangling the social layers which are constitutive for project-based learning; the core team, the firm, the epistemic community, and the personal networks.

After differentiating cumulative and disruptive learning regimes we explore in the second part of the chapter the basic organizational unit and the elementary learning arena of projects, the core team. It embodies temporal continuity and bears chief responsibility during the course of the entire project (DeFillippi and Arthur 1998). By moving from the core team to the firm, the analysis shifts (in the third part) 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 firm boundaries in fact is an emblematic feature of project ecologies. Project-specific knowledge creation ensues in the epistemic community (fourth part). 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 that endure and stretch out beyond the actual project (fifth part). 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, Barnatt, and Tempest 2000; Wittel 2001). The chapter concludes by sketching some avenues for future research.

The basic idea of project ecology has been developed in close dialogue between theory and empirical fieldwork. Two successive research projects contributed to its stepwise exploration. The first research project was a longitudinal empirical study of project-based organizing in the London advertising industry that comprised 78 semi-structured interviews (with an average duration of 120 minutes) in advertising agencies (with account managers, account planners, and art directors) and in collaborating film and post-production companies. By using inductive qualitative techniques to analyze the data (Eisenhardt 1989), the findings were aggregated and synthesized in a first conceptualization of the notion of the project ecology (Grabher 2002a, 2002b, 2003). On this basis, a second research endeavor aimed at a systematic comparison between two distinct yet comparable ecologies, the software ecology in

Munich and the advertising ecology in Hamburg. The empirical material on the Munich software ecology comprises thirty-eight semi-structured interviews (with project managers, software engineers, and key management personnel), the data on the Hamburg advertising ecology embraces twenty-nine interviews (with creative staff, account managers, and planners). These two bodies of research material provided the empirical basis of the comparative conceptualization of project ecologies (Grabher 2004a, 2004b; Grabher and Ibert 2006).

Contrasting project ecologies: cumulative vs. disruptive learning

We elucidate the conceptual framework by comparing two kinds of project ecologies that are driven by opposing logics and organizational practices of creating and sedimenting knowledge.

The key imperative in the software ecology is modularization (de Waard and Kramer 2008). 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 Davies and Brady 2000; Brady and Davies 2004; Davies and Hobday 2005; Frederiksen and Davies 2008; Schwab and Miner 2008). Software production in Munich exemplifies this cumulative learning regime.

The logic of modularization will be juxtaposed with a learning mode that is organized around the imperative of originality. Although learning by repetition also plays an important role, learning by switching ties both within and across organizations signifies the characteristic knowledge practice in this type of ecology. The advertising ecologies of London and Hamburg epitomize such a disruptive learning regime in which the overarching demand for originality minimizes the scope for repeatable solutions and convention defying is encouraged as a convention (Nov and Jones 2003: 9).

The chief aim of the following sections is neither to provide in-depth idiographic accounts of the local clusters in Munich, Hamburg, or London nor aimed at an exhaustive sectoral analysis of the software and advertising businesses. At issue is an empirically grounded conceptualization (see Glaser and Strauss 1967) of two types of project ecologies, a cumulative project ecology (derived from research on software in Munich) and a disruptive project ecology (based on the study of advertising in Hamburg and London). The argument occasionally risks brushing over idiosyncrasies of the empirical cases for the sake of the consistency and usefulness of a

conceptual template for studying the multilayered architecture of different types of project ecologies (see also Whitley 2006: 84).

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 (Söderlund, Vaagaasar, and Andersen 2008). Although the concrete personal constellations will hardly recur in successive projects, temporary organizations still are "organized around enduring structured role systems whose nuances are negotiated in situ" (Bechky 2006: 4). Abstracting from the idiosyncrasies of the production process, the respective core teams in the disruptive and the cumulative ecologies 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) 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; on advertising, see Pratt 2006: 6–12). 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 kinds of project ecologies, however, cognitive distance is enacted in fundamentally different ways. Whereas the interactions and practices of the core team in the cumulative ecology are geared towards reducing cognitive distance, project organizing in the disruptive ecologies rather is aimed at preserving cognitive distance.

The organizational repertoire to reduce cognitive distance in the cumulative ecology includes 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: 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.

In the disruptive ecologies, 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: 56–7). Professionals hardly change roles within the core team. 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 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 cumulative as well as the disruptive ecologies are quite obviously populated by firms. Firms sustain ongoing and repetitive business processes that are instrumental in managing project portfolios (Gann and Salter 2000; Geraldi 2008; Blichfeldt and Eskerod 2008; Ariuta, Smith, and Bower 2009). By handling a range of consecutive and related projects,

firms in both kinds of ecologies in fact aim at enhancing and accumulating particular "project capabilities" (Davies and Brady 2000; Brady and Davies 2004).

In disruptive as well as cumulative ecologies firm-specific best practice is codified in tools which align collective effort by providing menus and checklists for risk assessment, costing, project design, scheduling, and contractual agreements. 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 cumulative ecology but much more palpable in the disruptive ecologies around the "stars" and agency founders (after whom, symptomatically, agencies are named). Most recent contributions to the project literature indicate that codified knowledge also materializes in knowledge artifacts which in turn perpetuate corporate cultures. For instance, routines that are stored in manuals, checklists, or excel charts (Cacciatori 2008) are frequently reenacted in consecutive projects. New managerial practices are not only illustrated but also invoked and mediated by alternative ways of representing organizational charts (Taxén and Lilliesköld 2008).

Economies of recombination: modules, products

While in our ecologies project-to-project and project-to-business learning allows firms to reap "economies of repetition" (Davies and Brady 2000), only the cumulative ecology benefits from economies of recombination to a substantial degree. 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 (Brusoni and Prencipe 2001; de Waard and Kramer 2008).

Economies of recombination 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 the creation of novel combinations of familiar elements and by-products from previous projects (Hansen, Nohria, and Tierney 1999). 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 (Davies and Brady 2000: 952; Frederiksen and Davies 2008). This move widens the scope for reuse in the sense of increasing the "utility" (by enhancing ease of modification) and/or "variability" of code (by boosting adaptability to different contexts). Learning by recombination, however, is rather ambiguous. Extra effort has to be spent on standardization, codification, administration, and coordination. The related costs come at the expense of the respective project budgets (Ibert 2004; de Waard and Kramer 2008).

Furthermore, at the time knowledge is preserved it is difficult if not impossible to anticipate the concrete situation in which this knowledge will be retrieved. The future value of knowledge stored in modules is highly uncertain.

In the Munich ecology, for instance, 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 managing repositories of components are also assigned a quality certification role; see also Fichman and Kemerer 2001). Primarily 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 (Fichman and Kemerer 2001). Projects, in other words, are client-sponsored external 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 disruptive ecologies. In advertising, for instance, individual campaigns have to be in tune with the registers of a brand identity comprising aesthetic details such as color schemes, graphic elements, tonality of images and sounds, as well as the conceived character of the brand as conveying an air of youthfulness, trustworthiness, or inexpensiveness, for example. Within these parameters the professional ethos of creativity as well as the explicit demands of the clients for fresh ideas limits the scope for reuse to an absolute minimum. Moreover, the individual aesthetic and semantic registers of one brand (like a color scheme) cannot simply be recombined like chunks of software code to design a second brand identity. Economies of recombination are not a viable learning strategy in disruptive ecologies.

Epistemic community: 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, David, and Foray 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). Epistemic communities in disruptive and in cumulative ecologies extend beyond the firm to involve the same set of actors, that is, clients, suppliers, and corporate groups.

The very notion of the "community" evokes a sense of persistence, coherence, and harmony that not only seems absent but even not desired in the originality-fixated advertising ecology. The rivalry in the antagonistic learning practices and transience of ties in the disruptive learning regime might collectively be called epistemic (Lindkvist 2005). Since our focus here however is on the basic architecture of project ecologies we will retrain from elucidating this differentiation in this chapter. (For further details, see Grabher 2004: 1498).

Clients: technical vs. personal lock-in

Clients play a central role in knowledge production that is not confined to initiating and sponsoring the entire venture. Both kinds of ecologies are driven by the strategic goal to transform a single project into a lasting relationship. In both contexts, projects thus are strongly conceived as strategic pivots from which to leverage a continuous stream of business. Apart from sharing an interest in transforming projects into relationships, disruptive as well as cumulative ecologies rely on different practices to "lock-in" clients.

In the cumulative software ecology, user participation appears particularly deep (see Lehrer 2000: 592; Petter 2008). 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. The client's expectations, although specified in the brief, typically do not consolidate 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 project specifications as a consequence are "racketing up" (Girard and Stark 2002: 1940). Such "scope creep" (Jurison 1999: 33) notoriously puts pre-calculated plans of resource allocation at risk. 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 the cumulative ecology ranges from training 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 the disruptive advertising ecologies is interrelated with lower degrees of technical interdependencies of the project output with the existing business of the client. Of course, individual campaigns have to correspond to brand identities. Such interdependencies, however, are more an issue of interpretive plausibility than of technical compatibility. Consequently, the leeway for strategic scope creep in the disruptive ecology is 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 by individual taste and esthetic preferences, trust in the expert's judgment is of considerable value.

Trust does not equal involvement though. 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 the London advertising ecology has been referred to as "educating clients" (Grabher 2002b: 250). This practice encompasses, besides agreeing on basic esthetic parameters, clarifying the division of labor that is rooted in mutual respect for professional competencies. Whereas client involvement in the cumulative ecology is strongly driven by the necessities and (leveraged opportunities) to integrate the project output into "legacy systems," client participation in the disruptive ecologies is limited by the creative ethos that demands at least temporary independence from the interference of clients who characteristically are seen to associate creativity with risk (Shelbourne and Baskin 1998).

Suppliers: orchestration vs. improvisation

The different degrees of client involvement correspond with inverted roles of suppliers. In the cumulative ecology the higher degree of client involvement corresponds with a relatively lower intensity of ties with external collaborators. 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-à-vis extended supplier networks. In fact, freelancing is frequently derogated as "body-leasing" by smaller service providers.

The modularization of projects as well as the analytical professional ethos favors a partition of jobs among project collaborators that resembles orchestration. In organizational terms, orchestration involves a clearly defined role of a single leader, a clear assignment of task 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 again placed on continuity. Long-term collaboration with a relatively stable set of suppliers additionally not only lowers transaction costs but also affords interactive learning processes that benefit the subsequent maintenance and upgrading of software.

In the disruptive ecologies 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). Collaboration with creative suppliers mimics organizational features of (jazz) improvisation, a "prototype organization" designed to maximize innovation (Hatch 1999). Improvisation implies a rotation of leadership during performance and a deliberate interruption of habit patterns. 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. New team members hold the promise of new ideas (Grabher 2001: 367–9; see also Perretti and Negro 2007).

Corporate groups: product vs. client-centered affiliation

The knowledge practices, more and more, are molded by corporate groups into which the ecologies increasingly become tied. In the cumulative ecology the importance of corporate groups is immediately obvious through the presence of truly global software brand names like SAP, Oracle, or Microsoft. Beyond direct ownership, smaller firms are often tied to corporate groups through license agreements which primarily refer to the client-specific adaptations of the product portfolio of the large corporations in the context of recurrent projects. License agreements typically aim at generating feedback from the front line 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 yields positive reputation effects through which for instance the label "Oracle approved" facilitates access to additional clients.

The significance of the large corporate domain in the disruptive ecologies is far less perceptible, and deliberately so. Since affiliation of London advertising agencies with the three leading global communication groups, Interpublic, Omnicom, and WPP, 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 2008), 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 federated groups.

Whereas the corporate groups in the cumulative ecology crystallize primarily around products, they evolve around clients in the advertising ecologies. In advertising, for instance, the key rationale 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. For software firms the involvement with a group

encompasses 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 whereas 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 in the disruptive ecologies 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 Pratt 2006).

Personal networks: communality and connectivity vs. sociality

Epistemic communities 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 of the "pipes" through which resources are conveyed to achieve the specific project aim. Project ecologies however also comprise personal networks that endure and stretch out beyond the manifest pattern of the actual production networks. Although these more latent personal ties can be activated to solve specific problems in the actual project (Starkey, Barnatt, and Tempest 2000; Söderlund, Vaagaasar, and Andersen 2008) they more typically remain in the project background and provide lasting support for the individual members in multiple ways.

In the disruptive and cumulative ecologies 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 different degrees of social embeddedness (Granovetter 1985) as indicated by the multiplexity of ties (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). The three network types, phrased differently, range from the socially thick, friendship-like relations of communality to the socially thin, workmate-like relations of connectivity with sociality occupying an intermediate position. The proposed differentiation of network ties is an inductive typology employed to systematize empirical observations and direct further theoretical imaginations on latent personal networks in cumulative and disruptive ecologies (Table 7.1).

Table 7.1 The nature and functions of personal networks in cumulative and disruptive project ecologies

	Communality	Sociality	Connectivity
	Cumulative	**Disruptive**	**Cumulative**
Nature of ties	Lasting, intense	Ephemeral, intense	Ephemeral, weak
Social realm	Private cum professional	Professional cum private	Professional
Governance	Trust	Networked reputation	Professional ethos
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. Communality appears of higher relevance in the cumulative ecology. The cumulative learning regime translates into comparatively long affiliations with firms which in turn reduce the likelihood that network ties with former colleagues from school and university or with long-term workmates are disrupted by inter-firm and inter-regional mobility. Long-term organizational affiliations and a comparatively strong attachment to the locality engender the evolution of personalized experience-based trust as the chief governance principle. The robust architecture based on common personal experience 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, however, does not necessarily imply high frequency of interaction. 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. 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.

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). Sociality represents the archetypical form of

networking in the disruptive ecologies. Whereas communality evolves through stability and long-term commitments, sociality is driven by the canonical compulsion of mobility and flexibility. Short 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 Armbrüster 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.

The more complex 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) is primarily seen as instrumental for easing professional agendas it typically remains superficial. Hence, sociality is less limited than communality and involves several dozen to a few hundred ties.

In the disruptive ecologies 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 DeFillippi and Arthur 1998; Tempest and Starkey 2004; Pratt 2006). The circulating know-whom is not confined to information on mere availability but also refers to generic project skills like reliability and stress tolerance.

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. Connectivity is relatively distant from the personal realm; 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. These virtual and ephemeral forms of exchange hardly seem to engender personalized trust nor do they unfold the dynamics of networked reputation. Nevertheless, online networks depend on a sort of generalized reciprocity to preserve the collectively accumulated knowledge from excessive free-riding. Under conditions of (close to) anonymous exchange connectivity seems to be governed by professional norms and ethos (see also Grabher and Maintz 2006). 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. The far-reaching connectivity complements the restricted communality in the cumulative 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, which 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 connectivity is a most effective vehicle for upgrading and reformatting software skills on a day-to-day basis. 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 Amin and Roberts 2008).

Summary and discussion

Inspired by a contextual perspective on projects (Blomquist and Packendorff 1998; Ekstedt et al. 1999; Gann and Salter 2000; Grabher 2002a; Sydow and Staber 2002; Engwall 2003; Brady and Davies 2004; Scarbrough et al. 2003; Söderlund 2004; Davies and Hobday 2005; Frederiksen and Davies 2008; Schwab and Miner 2008), this chapter set out to unfold a conceptual framework for analyzing processes of project-based learning. This framework has been built around the notion of project ecology (Grabher 2002a, 2002b, 2002c, 2004a, 2004b; Grabher and Ibert 2006; Ibert 2004). By consecutively probing into the constitutive layers of project ecologies—the core team, the firm, the epistemic community, and personal networks—the multilayered organizational architecture of project ecologies was revealed. This architecture provides the theoretical template for a comparative exploration of the cumulative and the disruptive ecologies (see Table 7.2).

Starting with the basic organizational layer of the project ecology, the core team represents the elementary learning arena. While the software ecology seeks to facilitate cumulative learning through reducing cognitive distance within the core team, the advertising ecologies cultivate rivalries and maintain 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 kinds of ecologies firms reap "economies of repetition" (Davies and Brady 2000) by transferring lessons from individual projects into a firm-specific set of organizational tools, a distinctive culture, and a repertoire of stories. The cumulative 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 kinds of ecology 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 cumulative ecology might more aptly be described as being performed *with* the client, whereas advertising projects are closer to being realized *for* the client (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 the cumulative ecology and the challenge to "always change a winning team" (Mayer 2008: 137) for the sake of freshness in the disruptive ecologies. The increasing affiliation with global corporate groups implies for the cumulative ecology a widening of the portfolio of modules and skills, whereas group affiliation in the disruptive ecologies 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 temporarily manifest organizational networks, ecologies also unfold a wide and latent though more enduring fabric of personal networks. The cumulative learning mode of the software ecology 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 into socially thin and vast virtual networks (connectivity) that afford a continuous upgrading of skills and the occasional exchange of specific know-how. The disruptive learning regime that predominates in the advertising ecologies of Hamburg and London, in contrast, favors ephemeral, yet intense variants of networks (sociality). Sociality, suggestive of a commodification of networks, is instrumental for building up know-whom.

The constitutive organizational layers, however, do not only support distinctive dynamics of creating and sedimenting knowledge (as revealed by reading Table 7.2, line by line). Moreover, the two kinds of 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 7.2 suggests). 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 cumulative ecology. The firm is not only a prime locus of accumulating generic project capabilities, it also affords a chief repository of specific project know-how that is sedimented in modules and products. The firm thus embodies key memory functions in the cumulative ecology (Ibert 2004). In the disruptive ecologies, 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 know-whom that is indispensable for the relentless

Table 7.2 The multilayered architecture of cumulative and disruptive project ecologies

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

rewiring of ties and recombination of teams. In this sense, the repositories of knowledge in the disruptive ecology are located in both the firm and the personal networks.

Regardless of industry-specific differences, the notion of the project ecology seems a useful conceptual template for at least three reasons. First, context and projects are regarded as co-constitutive. The notion thus overcomes the weaknesses of both, traditional approaches of project management and institutional views on organizing. Whereas the former tend to neglect the manifold interactions between project and context at all, the latter tend to privilege, implicitly at least, a one-directional influence of an (a priori given) institutional context onto organizations. The notion of 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.

Second, the notion of the ecology accentuates diversity. A project ecology not only comprises 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 analysis becomes more 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 project, the firm, and their personal professional aspirations (Grabher and Ibert 2006). The notion of project ecology avoids the functionalism of "best practice" approaches and instead brings to light the hidden costs and paradoxes of the project business (see also Hodgson and Cicmil 2006).

Finally, the notion of project ecologies appreciates the diffuse sphere of networks that outlast the particular project. By appreciating a range of latent ties networks are not only perceived as "pipes" through which resources are conveyed but also as "prisms" through which other members of the ecology are observed and assessed (Podolny 2001). These latent networks moreover epitomize potentiality (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 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.

FUTURE DIRECTIONS

Our juxtaposition of cumulative and disruptive ecologies is based on and illustrated with the software ecology in Munich and the advertising ecologies in London and Hamburg. However, we contend that the notion of project ecologies can be usefully applied to explore the multilayered organizational architecture of project-based organizing in different industrial settings (see also Ekstedt et al. 1999: 192; Asheim 2002; Whitley 2006). In our view, research in two fields might be particularly rewarding.

First, the project literature to a considerable degree focused on ecologies that are anchored in firms. The quintessential example is the construction industry that for a long period of time represented the privileged field to study and to conceptualize project organization. The quintessential role of project organization in the construction industry is reflected in the fact that 46 percent of all papers in the *International Journal of Project Management* between 1984 and 1998 were devoted to this industry (Themistocleous and Wearne 2000: 11). Against the background of the enormous upsurge of interest in the creative and cultural industries more broadly, the literature on project organizing has also theoretically engaged with the organizational anatomy of ecologies that are embedded in firms and networks, like feature-film production (for example, Jones 1996; Bechky 2006; Schwab and Miner 2008). Ecologies that basically evolve around networks and in which firms play only a minor role have attracted less attention so far. Possible cases are certain segments of the video-game industry or open-source projects in which latent and more informal layers of a project ecology seem to play an overarching role not just as a passive background but as essential source of personnel, organizational, motivational, and knowledge resources.

Second, project research has accumulated a considerable body of knowledge on the management of single major events (like world exhibitions or world championships) or (infrastructural) mega-projects. This literature often took issue with the managerial practices of coping with the organizational (ir)rationalities of managing complex projects with large numbers of contributors, long time-spans, and/or considerable degrees of technical complexity and interdependence under tight budgetary and time constraints (see, for example, Flyvbjerg, Bruzelius, and Rothengatter 2003; Pitsis et al. 2003; Marrewijk et al. 2008). Contextual views have been rarely employed for this type of projects. In particular, the question of learning from major single or rare events (as diverse as natural disasters, major infrastructural breakdowns, or economic crises) has so far hardly been dealt with in a systematic fashion (for an important exception, see Lampel, Shamsie, and Shapira 2009). The notion of project ecology, we maintain, might be a useful template to explore how actors in such events mobilize resources from personal networks, rely

on proven sets of organizations to mobilize knowledge resources and to sediment experience (Cacciatori, Grabher, and Prencipe 2007). The specific challenge in these cases seems not only the mobilization and enactment of a familiar context but to select appropriate contexts that enhance learning beyond the routinized cognitive repertoire and familiar post hoc rationalizations (Lampel, Shamsie, and Shapira 2009).

Acknowledgements

This chapter draws on the conceptualization of project ecologies as first published in Grabher 2004b. The authors gratefully acknowledge financial support of the Deutsche Forschungsgemeinschaft (DFG: GR 1913/3).

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