Cross-Boundary Information Systems Development: A Practice Theory Based View

Abstract

Growth of consumer-faced information systems (IS) applications shifts IS designers from seeing their work as "capturing and automating requirements" to seeing it as "innovation in product development." The new metaphor engenders organizational practices targeted at fostering innovation. One such practice is establishment of professionally and organizationally diverse development teams charged with creatively combining individual competencies within the resulting product. A longitudinal field study of one such team was conducted in order to build a practice-based framework for understanding cross-boundary collaboration on IS development (ISD) projects. The frameworks shows that multi-party ISD collaboration can be understood as a struggle of agents situated in nested and intersecting industry, organization, profession, and project-based settings or "fields-of-practice." The development practice is situated at the nexus of these fields. It can be seen as a collective "reflection-in-action" process that increasingly defines the product. Whose competencies get to be reflected in the product and the degree of novelty the product achieves depend on agents challenging or following established status relationships within project teams and across organizations and professional groups.

Introduction

Emergence of the World Wide Web technologies has transformed IS development from delivering business applications to a user audience obliged to adopt them, to delivering consumer-facing applications to a user audience free to choose among a variety of IS products. Being outside the managerial control of corporations (Zuboff 1988), consumer-users must be enticed to use and transact with the system making the resulting IS a consumer product in its own right. No longer do developers in these settings look at their jobs as "capturing requirements" and "automating processes." The word "automate" is replaced by the words "design" and "innovate" and with that goes acknowledgement of a need for new kinds of work practices.

Research into such work practices can be found in the literature on innovation and product development. This literature indicates that settings that combine diverse professional expertise (e.g., Kogut and Zander 1992; Nonaka 1994; Grant 1996; Hargadon 1998) and knowledge resources across organizations (e.g., von Hippel 1994; Grant and Baden-Fuller 1995; Liebeskind et al. 1996; Powell et al. 1996; Dyer and Singh 1998) create a greater potential for innovative outcomes. Modern IS development settings seem to reflect this mentality. The emphasis on bringing together a diverse group of stakeholders is particularly profound in the web development arena due to the novelty of this area of activity, the pace of evolution of technical platforms, and the strategic positioning of these products in many firms. People from different walks of life—business strategists, technologists, graphical designers, marketers—work together to invent new IS offerings. Some of them, like strategy consultants, have not typically participated in product development before. Others, like artists, have often not worked in traditional corporations. Many web-based applications involve sub-contracting all or part of the development to a specialized firm. The purpose of this paper is to analyze how people from diverse walks of life and organizational settings collaborate on IS Development (ISD) projects and how such collaboration shapes the resulting product.

ISD has always involved multiple stakeholders, but the IS literature has traditionally focused on collaboration between technical developers and users (e.g., Boland 1979; Markus 1983;

Orlikowski and Gash 1994; Wastell 1999) or among different types of users (e.g., Bødker et al. 1988; Goodman and Darr 1998). While understanding these relationships is critical, it does not directly address questions that arise when different types of developers are involved (Agarwal et al. 2000). In the IS outsourcing literature, researchers acknowledge that "the ability to share knowledge" and build relationships affects outsourcing outcomes (Kern 1997), but do not explore the actual development practices on outsourced IS projects (Levina 1999).

Modern IS development settings show organizational commitment to bringing together the competencies of diverse actors in the design process. This is evident from the investments organizations make into building integrated ISD project teams. However, the results produced by professionally and organizationally diverse teams differ drastically in quality and kind. While the potential for innovation is high, the potential for conflict and stagnation is even higher. It is crucial then, to develop a practice-based framework for understanding how people involved in multi-party ISD collaborate on projects and how such collaboration shapes the resulting IS product. Insights presented here are drawn from an ethnographic field study of a web-development project and show how different status, organizational, and professional boundaries involved in ISD become salient at different times and how participants' interactions across such boundaries shape the emergent product.

The next section overviews background literature on ISD and new product development. The next section outlines the key theoretical lens adopted for the study. Following is a brief outline of methods. The next section presents data analysis and is followed by implications. Full details of my study can be found in Levina (2001).

Background Literature

IS researchers have investigated various aspects of diversity of backgrounds brought to bear on IS projects. As already noted, the bulk of prior worked focused on the collaboration between professional developers and users. A major contribution to understanding collaboration between technical developers and users was made by the so called "Scandinavian school" of "user-centered" or "cooperative" design, which concluded that professional designers do not have the right to impose their viewpoints on users and, instead, need to actively involve users in the

design process (overviewed in Bødker et al. 1988; Ehn 1988). Researchers focused on understanding when and how to involve users in the design process and how to customize various technology representations to user contexts (e.g., Tolvanen et al. 1993; Kyng 1995; Bødker 1999; Rossi et al. 2000). Drawing on this tradition, researchers also explored how distinctions among shaped the role of the emergent IS product in future use: managers vs. line workers (e.g., Bødker et al. 1988), hospital administers vs. doctors vs. nurses (Bloomfield and Coombs 1992), aircraft commanders vs. pilots (Linde 1988), and others.

While understanding the relationship between users and developers and among users is critical, it does not directly help us address the questions that arise when different types of developers are involved. When it comes to distinctions among developers, IS researchers have focused primarily on the distinction between more experienced (better) developers and novice or less able developers. An important early contribution to this stream of work by Vitalari (1985) showed that less able developers were likely to pay less attention to important practices and interests of users. Later work shows how more experienced developers had advantages in learning newer (object-oriented) design techniques (Agarwal et al. 2000). This work does not focus on the collaboration of different types of developers, but rather sheds light on the importance of differences between experts and novices.

Another important stream of relevant research involves the study of relationships between business clients and developers. For example, drawing on agency theories and theories of control, researchers investigated various modes of control that business clients were likely to exhibit over IS projects. For example, Kirsch and colleagues (1996; 2002) show that depending on outcome measurability, behavior observability, and clients' understanding of ISD processes, client liaisons are likely to prefer different modes of control: outcome control, behavioral control, clan control, or self control. With the increase of outsourced IS projects, the interaction between clients and developers-consultants becomes even more complex. IS outsourcing literature acknowledges that the ability to share knowledge" and build relationships affects outsourcing outcomes (Kern 1997; Koh et al. 1999; Sabherwal 1999), but hardly explores the actual practices of developers and managers in outsourced settings (see Levina 1999). However, findings from studies of internal client-developer relationships may not directly generalize to this

new context. For example, Gable and Chin (2001) show that in outsourced projects client attitudes towards control have low explanatory power, instead, arguing that consultants have power to block clients' involvement. This somewhat contradicts Kirsch's emphasis on the client's power over the relationship and calls for further investigation of collaborative practices on outsourced IS projects.

Overall, an examination of prior literature on ISD shows several trends. First, studies of ISD projects showed that coordination of diverse expertise is a critical factor in predicting project outcomes (Kraut and Streeter 1995; Faraj and Sproull 2000). Faraj and Sproull (2000) argued that coordination of diverse expertise was a more important predictor of project effectiveness than traditional factors such as administrative coordination, individual expertise, or development methodologies. Second, IS literature has treated the issue of collaboration on IS projects only fragmentally, focusing on specific differences in expertise one at a time: users vs. developers, managers vs. end users, expert vs. novice developers, or business clients vs. IS developers. In addition, there is little work on professional differences among IS developers despite increasing specialization in job titles (e.g., systems analyst, network administrator, database designer, code developer, graphical designer). Third, researchers examining collaboration on ISD projects have consistently reported on the importance of the political dimension of the collaboration, addressing issues of power and control. When organizational actors from diverse backgrounds come to work together on ISD projects they necessarily bring with them the distinctions not only in skills and knowledge, but also in interests. IS researchers observed the importance of the political aspect of ISD projects a long time ago (Boland 1979; Markus 1983; Markus and Bjorn-Andersen 1987; Bødker et al. 1988), but primarily in the context of users/managers vs. IS professionals. However, the increasing diversity of backgrounds among IS professionals calls for an examination of power issues among developers as well.

The professional and functional differences among developers have been a focus of new product development literature, which studied practices involved in collaborating across marketing, R&D, production, and manufacturing units in organizations (Dougherty 1992b; Dougherty 1992a; Bechky 1999; Carlile 2002) and within professionally diverse R&D teams (Hargadon and Sutton 1997; Hargadon 1998; Leonard and Swap 1999). This literature points to the necessity

and value of conflict in such settings and the importance of creating and sharing various objects/artifacts that facilitate work – boundary objects (Star and Griesemer 1989). In relation to ISD, the importance of practices and objects produced through practices is echoed by the Scandinavian school (e.g., Tolvanen and Lyytinen 1994; Bødker 1998) and in recent work on ERP implementation (Pawlowski et al. 2000), but again with the focus on user developer collaboration.

Given the impact of diverse expertise coordination on project outcomes, the review of ISD and product development literature shows a need for a closer examination of practices on ISD projects. This brief review also indicates that such examination should pay close attention to the interests and conflicts that arise on such projects and to the role of objects in such practices.

Theoretical Foundations

Given the diversity of backgrounds found on ISD projects, one needs a lens for understanding distinctions that are based on profession, years of experience, organizational affiliation, organizational status, gender, age, and so on as they naturally overlap in practice. One lens that helps us understand how practice shapes actors' identity and actors, in turn, shape practice on the basis of their identity and the context for action is provided in the works of the French sociologist Pierre Bourdieu, who argued that distinctions form the basis for understanding societies (1998).

Bourdieu's key insight was that distinctions were sorted out in settings, or "fields of practice" (Bourdieu 1984). At any time an individual or institutional actor, ("agent") can engage in multiple fields of practice, each of which shapes her or his interests and practical competencies. These fields of practice both *unite* and *divide* agents. On one hand, fields unite agents in pursuit of a common *interest*. This is the claim typically made about the function of the fields of practice in the literature on communities of practice (Brown and Duguid 1991; Lave and Wenger 1991; Orr 1996; Wenger 1998). Researchers in this tradition adopted Bourdieu's notions to study how professional (e.g., copy technicians from Brown and Duguid 1991) and task-based communities (e.g., copy technicians from Brown and Duguid 1991) coalesced around a joint interest in developing competence in a given profession or task.

On the other hand, conflicts and boundaries are pervasive in every field. For example, the butchers' community of practice described by Lave and Wenger (1991) strongly differentiated masters and apprentices on the basis of tasks performed. Apprentices were "stuck" performing monotonous tasks, and felt totally dependent on and subordinate to masters, who were doing more interesting and prestigious tasks. Similarly, medical training draws strong hierarchical boundaries among medical students, interns, residents, and attending physicians on the basis of the years of training in the profession. Hence, fields not only unite agents in pursuit of common interests, but also divide them based on the relative amount of skill, education, money or other types of resources (*capital*) that are valued.

Within a field, agents are engaged in *producing* a particular new form of capital by drawing on, integrating, and trading different forms of capital from other fields. Diverse fields compete with each other by *producing* various forms of capital that can be exchanged for others. For example, the butchers described by Lave and Wenger traded their meat cutting skills for salary (economic capital). Other fundamental types of capital that are traded among fields are cultural and social. There is a hierarchy of cultural prestige, so that doctors, for example, trade their professional skills not only for money, but also for respect as highly educated people who help others. Thus, a field not only unites and divides agents according to their interests, but also involves agents in producing a form of capital valued by society.

Each field exhibits a unique *logic of practice*—rules of the game by which one claims capital in the field (Bourdieu 1990). Fundamental to Bourdieu's theory is the precept that economic and cultural capital exhibit contradictory logics of accumulation. It takes different skills, values, and approaches to be a good math teacher than to be a good salesman.

Finally, each field can be analyzed on the basis of relative accumulation of different types of capital by its agents and on the basis of relative exchange rates among different forms of capital. The theory of practice posits that social relations captured in the form of capital are produced, reproduced, and transformed by agents through their everyday *practices*.

Bourdieu's lens helps in conceptualizing the overlapping interests in ISD when multiple parties are involved. Diversity of backgrounds brought to ISD projects can be understood through the notion of distinction or boundary which distinguishes agents practicing in different settings (field boundary) and agents who are different from each other within a setting – boundaries within the field: have vs. have-nots. Using Bourdieu's lens, relative distinctions or boundaries can be defined as objective and subjective limits that separate agents (individuals and institutions) into relational categories on the basis of their practices in a given setting. Prior literature in ISD dealt with one type of boundary at a time (user vs. developer or managers vs. line worker). So did researchers on innovation and product development, who separately examined functional (Dougherty 1992a; Carlile 2002), occupational (Bechky 1999), divisional or unit boundaries in organizations (von Hippel 1994; Szulanski 1995; Szulanski 1996; Dixon 2000), or inter-organizational boundaries (Liebeskind et al. 1996; Mowery et al. 1996; Powell et al. 1996; Lam 1997). However, in modern ISD, one typically finds integrated project teams rather than functionally divided organizational units interacting occasionally.

Applying Bourdieu's lens to ISD shows that professional developers and their business sponsors belong to different fields of practice. IS developers get rewarded and want to become better as professional developers, but business clients get rewarded for succeeding as managers in their industries. At the same time, they belong to joint fields in which the IS product is being developed and where success lies in delivering a high quality product efficiently. Similarly, IS developers belong to different professional fields: network administrators want to produce better networks, while DBAs want to produce better databases. Among programmers, senior programmers relate to junior programmers in ways akin to masters and apprentices. These multiple fields come together in a single ISD project and the complex power relationships among agents shape the practice and consequently its outcome—the IS product.

Research Methods

Data collection and analysis were guided by the principles of Bourdieu's reflexive sociology, which provides criteria for conducting and evaluating empirical work based on the theory of practice (Bourdieu and Wacquant 1992: 218-260). Following the call by Klein and Meyers (1999) for qualitative researchers to outline the criteria that should be used to judge their work,

five principles were determined and applied to the study: self reflection, use of multiple methods, relational thinking, modeling a concrete case, and radical doubt.

Table 1 reflects how these principles were implemented.

Insert Table 1 about here.

Starting in December 1999, I conducted a nine-month long field study of one Internet consulting firm (Eserve[1]) and its business clients (Pubco) using primarily ethnographic data collection techniques (Van Maanen 1979; Agar 1980; Schwartzman 1993; Van Maanen 1995). I spent four to five days a week, about six hours a day, in different settings at Eserve and Pubco resulting in 20 to 40 pages of typewritten notes a day (approximately 2,000 pages in total). Detailed observations and document analysis were supplemented with 39 in-depth interviews at Eserve and 21 interviews at Pubco. To understand positions of agents in various fields as well as to understand larger historical and societal forces that influenced the local phenomenon, I supplemented observational data with data from Human Resources database, web pages, industry analyst reports, popular press accounts, and financial statements about the IT consulting and publishing industry

Data analysis employed two primary techniques. First, inductive descriptions of typical practices at Eserve and Pubco were developed. For example, a key project practice was a project status meeting. I recorded who was invited to meetings, owned an agenda, asked vs. answered questions, etc. Descriptions of collaborative practices (meetings, email memos, team calendars, brainstorm exercises, IS development methodology, etc.) were used to build an interpretive view of the practices of different groups involved, as well as the evolution and change enacted therein. To elicit conflicts, I wrote vignettes describing the clashes and misunderstandings that occurred on the project. For example, in a Customer Interview story the clients and the consultants had trouble agreeing on who would conduct user interviews. Clients insisted it should be consultants and consultants asked clients for help to improve results. As a next step, I traced the conflicts to participants' relations that were institutionalized in key practices. For example, in this story

[1] Pseudonyms are used here for companies' names to protect anonymity and confidentiality of participants.

differences could be explained by examining the traditional role of clients, who pay the bills, vs. consultants, who do the work.

Then, using the second key technique, the creation of the "tables of pertinent properties of a set of agents" (Bourdieu and Wacquant 1992: 230), the analysis of conflicts was traced back to agents relative positions in fields. The technique involved recording properties of agents who were directly or indirectly involved in the study in a table. For example, these properties included agent's educational level, professional experience, and time spent on the project, (explicit in the employee database) as well as participants' perceptions of their colleagues' presentation skills or style of clothing (subjective properties from interpretive data). I then reduced the number of properties, for example, grouping management consulting experience with good presentation skills. This reduction was comparative (relational) rather than absolute. Not all management consultants were good presenters and vice versa. However, agents who came from management consulting tended to be better presenters than others and that became perceived as part of their social identity. Then, I systematically deduced a two-dimensional field structure (one dimension/boundary unique to the field in question and another dimension describing the relation of the field with the wider society as shown in Figure 3).

The Field Study Findings

Eserve

In 1999, Eserve was a young, rapidly-growing professional services firm engaged in end-to-end production of Business to Consumer (B2C) applications. The message flashing at visitors in Eserve's lobby described "Eservers" as "fast" and "fearless." Eserve was extremely successful on Wall Street and received a 90% client satisfaction rating in a third party survey. Historically, Eserve started by providing technical web development services. Then strategic consulting expertise was added, hiring MBAs and management consultants. In mid-1997, responding to competition from design and advertising agencies, Eserve added graphical design and marketing specialists. Eserve attracted recognized graphic designers by offering high salaries and stock options. Eserve claimed an ability to integrate different disciplines as its key competitive advantage.

> To build digital businesses, to get ideas, and to get them launched in the marketplace you need to put three kinds of people together in a 12x12 workspace. Culture is the key – collaboration, sharing, mutual respect. Real innovation is at the intersection of disciplines [Eserve's CEO].

Eserve was known for its egalitarian culture, "no hierarchy" approach. Team members on ISD projects were literally "rubbing shoulders" in a "no walls" "open space" environment, where even senior managers had no offices. However, Eserve did have an acknowledged hierarchical structure for teams and clearly-defined regional and corporate leadership. Eserve rewarded tenure in the firm and "old-timers" were quickly promoted. Outside industry experience, unless it was in the "web space," was largely discounted. Strategists and old-timer technologists occupied key project and firm leadership positions. Yet, there was almost no career ladder for graphical designers who were rarely project managers and did not hold any corporate leadership positions. Table 2 summarizes key distinctions that were prominent among professional groups at Eserve.

Insert Table 2 about here.

A key characteristic of Eserve projects was its three phase service delivery model: a Planning phase led by strategists with few designers and technologists; a Prototype Phase, which involved more graphical designers and fewer strategists; and an Implementation Phase led and staffed primarily by technologists. The so-called "Waves" service delivery model is captured in Figure 1. The model specified that strategists, who typically played the roles of account managers, project managers, and business analysts, were to interface heavily with clients and make key decisions, while technologists and graphical designers should be primarily involved in tasks associated with building the web-site. During the business development stage conducted at Eserve's expense, a client would negotiate a fixed fee for each phase contracted separately. While Eserve valued collaboration with the client, its methodology assumed that clients knew little about "the web space" and needed to be heavily "guided."

Insert Figure 1 about here.

Thus, two key boundaries in the Eserve field emerged as salient: one between old-timers and newcomers, and one between decision makers (strategists) and builders (technologists and designers).

Pubco

Conversely, Pubco, in 1999, was a traditional, multi-divisional publishing company. It had strong hierarchical and departmental distinctions characteristic of the industry (Epstein 2001). Hierarchical distinctions were almost entirely based on industry seniority. Humanities majors would enter the publishing industry soon after college and make their slow way up via either the editorial or the sales and marketing route. Thus, one of the key boundaries in the publishing field distinguished old-timers from newcomers. The second boundary was between book producers (editorial and production staff) and book sellers (sales and marketing staff). Authors and illustrators, the intellectual capital holders, manifest their presence in the publishing field through affiliation with editorial staff, while consumers, the financial capital holders, do so through their relationship with sales and marketing staff. Notably, the IT department at Pubco played only a supporting role and was mostly affiliated with finance and sales groups. Various web-development teams supported editorial staff.

Pubco's existing 100+ page Internet site was built without any overarching business or brand strategy primarily by editorial groups. By Fall 1999, Pubco's top management—under pressure from sales and marketing—concluded that an integrated web site that would target a wider audience of consumers, enhance Pubco's brand, and improve customer service was necessary. There was both a sense of competitive necessity and a sense of an emerging opportunity to put up a "good" web site quickly. In the words of Pubco's CEO, there was a sense that Pubco had "hit a web wall" and needed to act fast.

Eserve-Pubco

Pubco, therefore, partnered with Eserve to address web site issues—especially usability. After a three-month business development stage, the Eserve-Pubco project involved designing digital strategy (Planning – two month), redesigning old and developing new web functionality and look (Prototype – three month), and implementing the site (Implementation – five months). Because of prior poor experiences with consultants, Pubco approached the project, which was about to cost 6% of divisional operating income, cautiously. Pubco managers believed that consultants

had to be closely supervised. Figure 2 depicts the timeline and deliverables on the project for the period that was studied directly (until the end of the Prototype Phase).

Insert Figure 2 about here.

Bourdieu's lens allows viewing Eserve and Pubco as two distinct fields that exhibited a contradictory "logic of practice" and interests (Bourdieu and Wacquant 1992). For example, Eserve valued younger employees; Pubco valued older ones. Technologists were at the bottom of Pubco's food chain, but were more powerful at Eserve. Table 3 summarizes these differences. Most of the interests were misaligned from the beginning.

Insert Table 3 about here.

A predictable struggle between the two fields developed over whose logic of practice should drive the project, beginning in the business development phase. Initially, a top Eserve strategist in the relevant publishing consumer market proposed several innovative initiatives for Pubco's site. However, when Pubco learned about the rates that Eserve charged for putting top strategy consultants on the project, Pubco's CEO decided to use existing strategic planning initiatives and to scale down the Planning Phase. This was interpreted by Eserve as a lack of Pubco commitment to putting financial resources behind risky and innovative proposals. As a result, Eserve staffed the project with less experienced consultants. Pubco believed that, for the money they were spending, they should get Eserve's best and see innovative outcomes.

The first three weeks of the project left the clients disappointed and Pubco threatened to abandon the project altogether. The main complaint was the Eserve team's inexperience ("we did not get an 'A' team") and lack of the process for Pubco's complex business. Eserve consultants failed to read provided materials, repetitively asked the same questions, and did not engage Pubco participants. To make matters worse, in a reaction to the "need to involve the client in the process," an experienced Eserve manager guided consultants to conduct a series of workshops in which clients were asked to discuss initiatives, market trends, and competitive factors, but Eserve's ability to consolidate and analyze client feedback or generate interesting ideas was

never demonstrated. This was primarily due to Eserve team's learning curve in publishing business as well as "web-space" consultants' belief that they could be more innovative if they took a fresh perspective, not one generated by Pubco.

Halfway through the project's Planning Phase (week three and a half), Pubco sales and marketing personnel, who lacked understanding of the Eserve methodology and were disappointed with the workshops, became concerned that their essential initiatives were not receiving adequate consideration. Under pressure from the sales and marketing participants, Pubco's project manager had team members identify and prioritize their "must have" initiatives under the heading of "key elements of our web presence that we know we need to develop for our core business." The list was relayed to the Eserve team.

Meanwhile, Eserve consultants started picking up steam. They sought guidance from senior strategy experts, analyzed client initiatives, and generated some of their own innovative initiatives. However, they also received the "must have" list from the client. To save the relationship, Eserve decided that this client was too traditional to handle "out there" initiatives and that it would be best to proceed in a "consulting as usual" approach, which included pleasing the clients and "throwing tangibles" at them to show that they were getting their moneys worth. Eservers ended up recommending mostly those initiatives proposed by Pubco, and used a sophisticated analysis methodology to justify their recommendations. To Eserve's surprise, Pubco project participants were disappointed, saying that they expected more than their "must have" list. However, Pubco's top management liked the proposal and quickly sponsored the next phase of the project.

> Eserve is smart, but was not getting our feedback or internalizing. They were forming their own opinions. Then something happened week three and a half or four to turn things around [Pubco Manager].

Analysis of the project's Planning phase shows that the distinction between clients as economic capital holders (because they paid the bills) and consultants as cultural capital holders (because they built web sites) shaped the interaction and results. Further, Pubco's and Eserve's hierarchical and professional distinctions persisted on the project, reflecting the difference between economic capital holders (decision makers such as Pubco and Eserve managers) and

cultural (intellectual) capital holders (builders such as Eserve's line consultants and Pubco's IT and web-development group members).

However, despite the initial tension, participants had strong career incentives to make the project work. Shared interests evolved from participating in typical project management activities including scheduling exercises, status meetings, and the consulting industry staples—client presentation and deliverable handoff practices (Hallows 1998). While there was nothing unique about these practices, their key characteristic was the increasing dependence on the project history and prior decisions about the emerging artifact—the web site. For example, the first schedule produced had dates and responsibilities associated with standard Eserve practices: "A Use Case due in Week 2." The last schedule produced had such items as "Graphical Treatment 2.3 'Book Evaluation Page' due on Week 8. Day 3." Similarly, status meetings increasingly relied on project details and jargon. The main distinction produced and reproduced through these practices was between "people who knew what this project was about" and "people who did not."

As the project evolved, agents developed a common interest in defining the emergent web site and invested resources in fulfilling it. Being involved in the design set project participants apart from their organizational and professional peers, necessitating that they take credit (positive or negative) for project outcomes. This new project-based boundary also distinguished agents involved in the project from each other based on how much each of them was involved in the design and how much credit they could claim for it. It primarily distinguished project old-timers from project newcomers.

Thus, the involvement of agents in the new product development gave rise to a new field of practice—the project field. This field had two prominent boundaries: project involvement and status in society as depicted in Figure 3. Within the field, agents struggled to set exchange rates for the capital they accumulated in other professional and organizational fields vis-à-vis the capital of the new field. The struggle along the project-based boundary promoted the project's continuing with the design options already chosen, while the struggle along the societal status boundary promoted product diversification. Since the first boundary only existed during the

project, agents started by converting their societal status capital into project involvement capital and finished by converting their project involvement capital back into societal status capital. The IS product was a result of the struggle involved in these conversion processes.

Insert Figure 3 about here.

The struggle across these key boundaries shaped participant interactions over time. It was Pubco's managers who made critical decisions regarding the site's functionality and Eserve's managers who made critical decisions regarding development methodology—attaining important stakes in defining the emergent product. Technologists and graphical designers hardly participated in Planning phase decision making. Thus, societal status distinctions shaped much of the project-based capital accumulation among agents. On the other hand, the Eserve-Pubco project field also transformed some of the distinctions established in the Eserve and Pubco fields. Some junior strategists on the project, who had no experience in web consulting, quickly became very powerful because they were involved on the project from the beginning, unlike designers who joined during the Prototype Phase. Critically, Eserve's graphical designers, who were new to Eserve, to the team, and to business consulting, were at a disadvantage along both boundaries in the project field. They had no control over key resources or decisions, yet a key objective was to implement a graphically sound and innovative web site.

To summarize, multi-party product development collaboration can be understood as a struggle of agents situated in nested and intersecting industry, organization, profession, and project-based fields. The key field that emerged in this study was the ISD project field, which *united* agents in producing a new cultural capital – the IS product. In this field, agents engaged in combining their individual competencies and resources to achieve their common *interest* in *producing* this new form of *capital*. At the same time, the joint field *divided* agents on the basis of attaining this capital – being able to influence the design and claim credit for the outcomes.

Collective Reflection-in-Action Spiral

Given this new understanding of boundaries, the research question still required a means for examining how agents crossed boundaries in practice. Inductive data analysis from the field

study revealed that project participants engaged in a process that intertwined reflection on the development options with new options experimentation. Reflecting and experimenting were inseparable in practice and together constituted a process of reflection-in-action.

"Reflection-in-action" is a concept proposed by Schön to understand how professionals address uncertain and non-routine, yet repetitive, problems in practice (Schön 1983: 60). Reflection-in-action is a reflective "conversation with the material of a situation" (: 79).

> The unique and uncertain situation comes to be understood through the attempt to change it, and changed through the attempt to understand it (1983: 131).

Experimentation does not assume novelty. It is an action taken so as to see and evaluate its outcomes (1983: 145). A crucial part of reflection is the use of the actor's appreciative systems to judge the outcomes of the action and guide further experiments (1983: 135). In this research, Schön's work is extended to understand professional practice in collaborative environments that combine diverse expertise. I introduce the term *collective reflection-in-action* to describe a "conversation" with different audiences, which brings about dilemmas stemming from differences in appreciative systems of participants involved in different professional and organizational practice.

The analysis of multi-party collaboration indicated an important difference between individual vs. collective reflection-in-action. While individual reflection-in-action often involves tacit reflection, collective reflection-in-action necessitates that participants share objects explicitly (through visible or audible artifacts) so as to give an opportunity to collaborators to reflect on the results of individual experiments. Reflecting on the results of a colleague's experiments is the essence of working together. As one of the study participants insightfully observed: "We need to create objects to think with."

Data analysis allowed me to I identify different modes of collective reflection-in-action. On the project, Pubco produced market analysis guidelines and passed them on to Eserve to be reflected upon and use in subsequent actions. However, transferring an object for reflection to a recipient does not guarantee that the object will be used. If an object intended for reflection is ignored, relationships change because the recipient of an object has disregarded the authority of the

producer. Eservers initially ignored the guidelines passed to them by Pubco. Pubco's agents felt that their authority in controlling the project was challenged. Pubco re-established its authority by ignoring the results of Eserve's market analysis and prioritized its own web site initiatives. Figure 4 reflects the break in the collective reflection-in-action spiral in the case of "ignoring."

Insert Figure 4 about here.

If the recipient actually reflected on the object, he or she could either "challenge" or "add" to it, depending on the mode of collaboration followed. For example, given the disadvantaged position of Eserve's designers on the project field, they primarily followed the strategists' lead and added graphical design to specifications provided by strategists. Because designers joined the project late, they lacked critical capital in the field – involvement in the decisions made earlier about the emergent IS product. Thus, when the time came for them to develop graphical designs for the site, their initial experiments were quickly dismissed by strategists because the designers showed incompetence in the client's business. Instead, strategists provided designers with bare bones sketches of the pages (Wire Frames), which designers embellished with nice fonts and colors. Field data from other projects and interviews with designers show that good designs evolve from multiple alternatives that designers develop slowly over time with a lot of critical feedback and much iteration. Time pressure during the Prototype phase did not allow for such a design process. Instead, one design was adopted early on and evolved over time (strengthening the distinctions across the project-based boundary in which Eserve strategists had privileged positions). Figure 5 reflects an example of the collective reflection-in-action spiral in the case of "adding."

Insert Figure 5 about here.

When repeated multiple times, "adding" ("execution") mode of practice results in objects (including the final product) that primarily reflect the competence of those who made critical decisions early on. The resulting IS product was designed by Pubco managers and Eserve's strategists, not designers. Unlike the functional features of the site, which satisfied the interests of Pubco's sales and marketing managers, usability tests, as well as interviews with project participants, revealed that nobody was satisfied with the graphical and navigational design of the

site. The blame, however, was placed primarily on the lack of designer expertise and involvement. Eserve and Pubco had to invest into another site design effort with another team of Eserve designers which lasted almost as long as the initial design phase. The final design substantially resembled initial designs produced by the first design team, which had subsequently been ignored when strategists took the lead.

The "execution" mode of collaborative experimentation has limited potential for production innovation, but is likely to lead to timely project completion and preservation of status quo in boundary power dynamics. The "challenge" mode of experimentation is risky because it involves both challenging established authority and undoing what has been achieved in product development thus far. If an agent involved in challenge type collaboration fails (i.e., their experimentation is ignored), their position in the field worsens. For example, Eserve team members felt an urgent need to test the design on real users before official usability tests took place so as to fix critical problems early on. They proposed interviewing some of the people they knew who were using similar products and could provide feedback on the design. They shared their idea with Pubco, but were told to drop the plan because the interviewees were not in the right consumer segment. "Eservers" challenged Pubco's decision and collected the feedback, which elicited many of the problems later revealed through the costly usability studies. Pubco ignored the feedback as not valid and problems were not fixed in a rush to complete the project phase on time (save economic capital).

While the "challenge" mode of experimentation requires more investment and risk, it can result in a potentially innovative integration of diverse competencies in the product. For example, Eserve's strategists and Pubco's managers found their work on functional specifications (Use Cases) both fulfilling and productive. The work was conducted in a workshop, where Eserve strategists introduced specifications based on their "web space" competence, and Pubco's managers challenged specifications based on their competence in Pubco's business. After an engaging discussion, the specifications were updated according to a negotiated agreement. Everybody on the project and in wider organizational settings took pride in the proposed functional capabilities of the site. The challenge mode of experimentation is different from ignoring: in the former mode, reflecting on another person's work results in learning, which

influences new experiments; whereas, in the latter, no such learning occurs. Figure 6 reflects an example of the collective reflection-in-action spiral in the case of "adding."

Insert Figure 6 about here.

The Recursive Cycle of Collaborative Practice

The final IS product is shaped by the interaction of agents on the ISD team. At the same time, agents are inclined to interact in certain ways based on their competencies and positions in relevant organizational, professional, and project-based fields of practice (Bourdieu 1990). This process is recursive; agents end up claiming credit for their participation and shaping of the product design in the relevant fields of practice. Thus the emergent product plays a role in either preserving or transforming agents' positions in relative fields. Figure 7 shows how agents' relative power on the project is reflected in the resulting product.

Insert Figure 7 about here.

Agents' positions at Eserve, Pubco, and in society at large shaped their original positions in the project field through the economic and cultural capital brought to bear by team members. The economic capital of Pubco's participants played a crucial role in shaping the site initiatives. Pubco used its economic capital to select those site initiatives that it favored even before Eserve was engaged, ignoring Eserve's web space competencies and customer feedback. Novel web site initiatives that Eservers considered were quickly rejected as not building on Pubco's prior work. Pubco threatened to sever the relationship in the early Planning phase unless it could see that "Eservers" build on initiatives proposed by key Pubco sponsors. Immediately Eservers started reproducing the typical management consulting practices where every initiative was either generated by the client or suggested by Eserve knowing that it would please the client—i.e. execution mode of experimentation. The decision over the site's strategy was a stake captured by Pubco's project participants, which resulted in the best Eserve strategists soon leaving the project to work on more interesting projects and other strategists disengaging. Early functionality decisions carried through the end of the project and were reflected in the delivered IS product. The product implemented strategies pre-conceived by Pubco's managers before the project

began. This, in turn, reshaped Pubco's sales and marketing managers positioned within Pubco as they used the site to implement a process change within Pubco which improved product consistency in editorial departments, thus aiding sales and marketing efforts.

At the same time, Eserve's three phase service delivery model, relying on modes of work driven by strategists, excluded designers from many important decisions and institutionalized designers' "followers" role on projects. Although designers recognized this inequity, they were not inclined to transform the field arguing in interviews that the battle was bound to be lost. The modes of work that reproduced their domination in the field were enacted over and over again, resulting in an "execution" mode of experimentation. In the reflection-in-action spiral that emerged, joint product stakes such as the amount of functionality over aesthetics, were attained by the dominant party (strategists) time after time. This resulted in a final IS product which objectified the dominated position of designers. In the Eserve field at large, the strategists who participated in the project claimed credit for working extra hard on the project and "pulling it through." Designers were all replaced in the next phase of the project and could not claim credit for the site in their portfolios.

Implications and Contributions

Eserve leaders made significant investments in training, incentive mechanisms, open space design, and other practices to make Eserve a "learning and sharing" organization. By doing so, they hoped to replicate innovative outcomes found in academic-like cross-disciplinary collaborations (Bødker et al. 1988). The rationale behind the "integration of disciplines" and "egalitarian culture" was that, in an environment with no hierarchy, there would be no incentive for hiding information, ignoring experimentation, or not taking ownership of the results by "disengaging" and simply following other participant's leads. Instead, through the collective reframing of a phenomenon from different perspectives, previously disintegrated knowledge would be "combined" or even "transformed" (Carlile 2001) into new cultural (intellectual) capital. This new intellectual capital could then be exchanged for economic capital—in the form of premium prices charged to Eserve's clients. Eserve and its clients made investments in fostering fields of joint practice like the Eserve-Pubco project, which offered product stakes that promoted each party's interest in collaborating. However, these stakes were not equally

attainable by all project participants, causing the "hiding," "ignoring," and "disengaging" behavior and resulting in the mediocre outcomes that Eserve was trying to avoid. Similarly, Pubco invested a significant amount of money and human resources in working with an innovative web-based consultancy rather than a traditional IT firm. However, traditional consulting industry practices and attitudes shaped Pubco's position in the Eserve-Pubco field and made it hard to resist client's advantageous role as holders of the economic capital. This resulted in Eserve strategists disengaging and choosing not to persuade Pubco to implement novel strategic initiatives and functionality.

The experiences of Eserve leaders and Pubco managers suggest that agents with control over economic resources play a crucial role in defining project priorities. In this way, they can facilitate or inhibit production of desired outcomes. On another project, Eserve, upon client's insistence, let designers lead the project from the beginning. Strategists then challenged designer's lead. This turned into a successful web-based product.

This research contributes to an understanding of ISD by providing a new *fields-of-practice lens* for understanding cross-boundary practices. The new framing provides insights into improving practices and outcomes through better negotiation of the interests involved. It offers a lens for future integration of previously diverse research streams on cooperative work (Bødker et al. 1988), development methodologies (Agarwal et al. 2000), business-IT relationship (Kirsch et al. 2002), and outsourcing (Sabherwal 1999; Kern et al. 2002).

This work also contributes to our understanding of ISD as a multi-party product development environment. Work on knowledge-based theory of the firm (Kogut and Zander 1992) has been criticized for not paying enough attention to the interests involved in competency integration (Foss 1996). Newer work has compensated by looking at interests, at the expense of understanding competencies (Conner and Prahalad 1996). The "fields-of-practice" lens allows an understanding of the interplay between the boundary that differentiates old-timers from newcomers in a field with other boundaries (such as functional). Researchers working in the communities of practice arena concentrate on understanding how competencies evolve by studying the old-timer vs. newcomer boundary, but in conditions when agents have interests in

becoming similar (Lave and Wenger 1991). This study examines the old-timer vs. newcomer boundary in situations where becoming similar in one field often compromises agents' positions in another field (e.g., in the professional field or another organizational field). Such an analysis exposes tradeoffs of interests involved in exploiting existing competencies on a project (accepting old-timers' dominance) vs. bringing new competencies into the project (allowing newcomers to challenge). It shows how the interplay between boundaries shapes the resulting product.

Finally, the "collective reflection-in-action" lens helps us open the black box of ISD, not just to see which societal forces and interests influence the product, but to see how the product is actually shaped through the sharing of system representations (objects) produced by participants. Figure 8 depicts a more conceptual version of the collective reflection-in-action spiral, which might be usefully applied to other IS development and use settings.

Insert Figure 8 about here.

An early application of the reflection-in-action lens to ISD practice can be found in the Professional Work Practice approach (Andersen 1990), which grew out of the Scandinavian school, but focused on work practices of professional developers. Like the work on new product development, this work also emphasized the importance of objects and tools needed to support professional learning (Lanzara and Mathiassen 1985; Bødker 1998). Yet, it did not explicitly focus on the collaboration of diverse developers, nor did it focus on the implications to product novelty. This paper shows how Schön's lens can be fruitful applied to analyzing not only individual, but collaborative practices. Professional Work Practice approach has been criticized for seeing ISD as a process of modeling reality surrounding designers rather than shaping these realities (Iivari et al. 1998). This paper's contribution is in showing how professional developers and business clients with diverse backgrounds and interests rather than objective realities shape the emergent product. Together the collective reflection-in-action and fields-of-practice lenses help us understand why ISD participants adopt one or other mode of practice and produce particular outcomes.

References

Agar, M. *The professional stranger: an informal introduction to ethnography* Academic Press, New York, NY, 1980, pp. xi, 227.

Agarwal, R., De, P., Sinha, A., and Tanniru, M. "On the usability of OO representations," *Communications of the ACM* (43:10) 2000, pp 83-89.

Andersen, N.E. *Professional systems development : experience, ideas, and action* Prentice Hall, New York, 1990, pp. xii, 283.

Bechky, B.A. "Crossing Occupational Boundaries: Communication and Learning on a Production Floor," Stanford University, CA, USA, 1999, p. 116.

Bloomfield, B., and Coombs, R. "Information Technology, Control and Power: The Centralization and Decentralization Debate Revisited," *Journal of Management Studies* (29:4) 1992, pp 459-484.

Bødker, S. "Understanding representation in design," *Human-Computer Interaction* (13:2) 1998, pp 107-125.

Bødker, S. "Scenarios in user-centred design - setting the stage for reflection and action," 32nd Annual Hawaii International Conference on System Sciences, HICSS-32, Proceedings of the Hawaii International Conference on System Sciences 1999. IEEE Comp Soc, Los Alamitos, CA, USA,PR00001.. Maui, HI, USA, 1999, p. 124.

Bødker, S., Ehn, P., Knudsen, J., Kyng, M., and Madsen, K. "Computer support for cooperative design," Conference on Computer-supported cooperative work, Association for Computing Machinery, Portland, OR USA, 1988, pp. 377-394.

Boland, R.J., Jr "Control, Causality and Information System Requirements," *Accounting, Organizations and Society* (4:4) 1979, pp 259-272.

Bourdieu, P. *Outline of a theory of practice* Cambridge University Press, Cambridge ; New York, 1977, pp. viii, 248.

Bourdieu, P. *Distinction: a social critique of the judgment of taste* Harvard University Press, Cambridge, Mass., 1984, pp. xiv, 613.

Bourdieu, P. *The logic of practice* Stanford University Press, Stanford, Calif., 1990, p. 333.

Bourdieu, P. *The state nobility: Elite schools in the field of power* Stanford University Press, Stanford, Calif., 1996, pp. xxiv, 475.

Bourdieu, P. *Practical reason: on the theory of action* Stanford University Press, Stanford, Calif., 1998, pp. xi, 153.

Bourdieu, P., and Wacquant, L.J.D. *An invitation to reflexive sociology* University of Chicago Press, Chicago, 1992, pp. xiv, 332.

Brown, J.S., and Duguid, P. "Organizational Learning and Communities-of-Practice: Toward a Unified View of Working, Learning, and Innovation," *Organization Science* (2:1) 1991, pp 40-57.

Carlile, P.R. "Understanding Knowledge Transformation In Product Development: Making Knowledge Manifest Through Boundary Objects," University Of Michigan, USA, 1997, p. 188.

Carlile, P.R. "A '3-T Framework' of Knowledge Boundaries," MIT Sloan School of Management, Cambridge, MA, pp. 1-41.

Carlile, P.R. "A Pragmatic View of Knowledge and Boundaries: Boundary Objects in New Product Development," *Organization Science* (13:4), July-August 2002, pp 442-455.

Conner, K.R., and Prahalad, C.K. "A resource-based theory of the firm: Knowledge versus opportunism," *Organization Science* (7:5), Sep/Oct 1996, pp 477-501.

Corbin, J.M., and Strauss, A.L. "Grounded theory research: Procedures, canons, and evaluative criteria," *Qualitative Sociology* (13) 1990, pp 3-21.

Dixon, N.M. *Common knowledge: how companies thrive by sharing what they know* Harvard Business School Press, Boston, 2000, pp. x, 188.

Dougherty, D. "Interpretive Barriers to Successful Product Innovation in Large Firms," *Organization Science* (3:2), Summer 1992a, pp 179-202.

Dougherty, D. "A Practice-Centered Model of Organizational Renewal Through Product Innovation," *Strategic Management Journal* (13:Special Issue) 1992b, pp 77 ,16 pages.

Dyer, J.H., and Singh, H. "The relational view: Cooperative strategy and sources of interorganizational competitive advantage," *Academy of Management Review* (23:4) 1998, pp 660-679.

Ehn, P. *Work-oriented design of computer artifacts.* Arbetslivscentrum, Stockholm, 1988, pp. xii, 496.

Epstein, J. *Book business : publishing past, present, and future*, (1st ed.) W.W. Norton, New York, 2001, pp. xiv, 188.

Faraj, S., and Sproull, L. "Coordinating Expertise in Software Development Teams," *Management Science* (46:12), December 2000, pp 1554-1568.
Foss, N.J. "More critical comments on knowledge-based theories of the firm," *Organization Science* (7:5), Sep/Oct 1996, pp 519-523.
Gable, G.G., and Chin, W.W. "Client Versus Consultant Influence on Client Involvement in Computer System Selection Projects: A Two-Actor Model of The Theory of Planned Behavior," Twenty-Second International Conference on Information Systems, New Orleans, LA, 2001, pp. 249-260.
Glaser, B.G., and Strauss, A.L. *The discovery of grounded theory; strategies for qualitative research* Aldine Pub. Co., Chicago, IL, 1967, pp. x, 271.
Goodman, P.S., and Darr, E.D. "Computer-aided systems and communities: Mechanisms for organizational learning in distributed environments," *MIS Quarterly; management information systems* (22:4) 1998, pp 417-440.
Grant, R.M. "Toward a knowledge-based theory of the firm," *Strategic Management Journal* (17:Winter) 1996, pp 109-122.
Grant, R.M., and Baden-Fuller, C. "A knowledge-based theory of inter-firm collaboration," *Academy of Management Journal* (Best Papers Proceedings) 1995, pp 17-21.
Hallows, J.E. *Information systems project management how to deliver function and value in information technology projects* Amacom, New York, 1998.
Hargadon, A., and Sutton, R.I. "Technology brokering and innovation in a product development firm," *Administrative Science Quarterly* (42:4) 1997, pp 716-749.
Hargadon, A.B. "Firms as knowledge brokers: Lessons in pursuing continuous innovation," *California Management Review* (40:3) 1998, pp 209-227.
Iivari, J., Hirschheim, R.A., and Klein, H. "A Paradigmatic Analysis of Contrasting Information Systems Development Approaches and Methodologies," *Information Systems Research* (9:2), June 1998, pp 164-193.
Kern, T. "The Gestalt of an Information Technology Outsourcing Relationship: An Exploratory Analysis," 18th International Conference on Information Systems, Atlanta, GA, 1997, p. 37–58.
Kern, T., Willcocks, L., and van Heck, E. "The winner's curse in IT outsourcing: Strategies for avoiding relational trauma," *California Management Review* (Winter) 2002, p 2002.
Kirsch, L., Sambamurthy, V., Ko, D.-G., and Purvis, R. "Controlling Information Systems Development Projects: The View from the Client," *Management Science* (48:4), April 2002, pp 484-498.
Kirsch, L.J. "The management of complex tasks in organizations: Controlling the systems development process," *Organization Science* (7:1) 1996, pp 1-21.
Klein, H.K., and Myers, M.D. "A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems," *MIS Quarterly* (23:1) 1999, pp 67-92.
Kogut, B., and Zander, U. "Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology," *Organization Science* (3:3), August 1992, pp 383-397.
Koh, C., Tay, C., and Ang, S. "Managing Vendor-Client Expectations in IT Outsourcing: A Psychological Contract Perspective," Proceedings of the Twentieth International Conference on Information Systems, Charlotte, NC, 1999, pp. 512-518.
Kraut, R.E., and Streeter, L.A. "Coordination in Software Development," *Communications of the ACM* (38:3), March 1995, pp 69-81.
Kyng, M. "Representations of work: Making representations work," *Association for Computing Machinery. Communications of the ACM* (38:9) 1995, pp 46-56.
Lam, A. "Embedded firms, embedded knowledge: Problems of collaboration and knowledge transfer in global cooperative ventures," *Organization Studies* (18:6) 1997, pp 973-996.
Lanzara, G., and Mathiassen, L. "Mapping Situations within a Systems Development Project," *Information and Management* (8) 1985, pp 3-20.
Lave, J., and Wenger, E. *Situated learning: legitimate peripheral participation* Cambridge University Press, Cambridge, England, 1991, p. 138.
Leonard, D., and Swap, W.C. *When sparks fly: igniting creativity in groups* Harvard Business School Press, Boston, Mass., 1999, pp. x, 242.
Levina, N. "Sources of Vendor Production Cost Advantages in IT Outsourcing," 4094, Center for Information Systems Research, MIT Sloan School of Management, Cambridge, MA.
Levina, N. "Multi-party Information Systems Development: The Challenge of Cross-Boundary Collaboration," in: *Sloan School of Management*, Massachusetts Institute of Technology, Cambridge, MA, 2001, p. 300.

Liebeskind, J.P., Oliver, A.L., Zucker, L., and Brewer, M. "Social networks, learning, and flexibility: Sourcing scientific knowledge in new biotechnology firms," *Organization Science* (7:4), Jul/Aug 1996, pp 428-443.
Linde, C. "Who's in charge here?: Cooperative work and authority negotiation in police helicopter missions," Proceedings of the conference on Computer-supported cooperative work, Association for Computing Machinery, Portland, OR, USA, 1988, pp. 52-64.
Markus, M.L. "Power, Politics, and MIS Implementation," *Communications of the ACM* (26:6) 1983, pp 430-444.
Markus, M.L., and Bjorn-Andersen, N. "Power over Users: Its Exercise by System Professionals," *Communications of the ACM* (30:6), June 1987.
Mowery, D.C., Oxley, J.E., and Silverman, B.S. "Strategic alliances and interfirm knowledge transfer," *Strategic Management Journal* (17:Winter) 1996, pp 77-91.
Nonaka, I. "A dynamic theory of organizational knowledge creation," *Organization Science* (5:1) 1994, pp 14-37.
Orlikowski, W.J. "The Duality of Technology: Rethinking the Concept of Technology in Organizations," *Organization Science* (3:3), August 1992, pp 398-427.
Orlikowski, W.J., and Gash, D.C. "Technological Frames: Making Sense of Information Technology in Organizations," *ACM Transactions on Information Systems* (12:2) 1994, pp 174-207.
Orr, J.E. *Talking about machines: an ethnography of a modern job* ILR Press, Ithaca, N.Y., 1996, pp. xvi, 172.
Pawlowski, S.D., Robey, D., and Raven, A. "Supporting Shared Information Systems: Boundary Objects, Communities, and Brokering," Twenty-First International Conference on Information Systems, Brisbane, Australia, 2000, pp. 329-338.
Powell, W.W., Koput, K.W., and Smith-Doerr, L. "Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology," *Administrative Science Quarterly* (41:1), Mar 1996, pp 116-145.
Rossi, M., Tolvanen, J.-P., Ramesh, B., Lyytinen, K., and Kaipala, J. "Method rationale in method engineering," 33rd Annual Hawaii International Conference on System Sciences (HICSS-33), Proceedings of the Hawaii International Conference on System Sciences 2000. IEEE, Los Alamitos, CA, USA.. Maui, USA, 2000, p. 51.
Sabherwal, R. "The Role of Trust in Outsourced IS Development Projects," *Communications of the ACM* (42:2), February 1999, pp 80-86.
Schein, E.H. *Organizational culture and leadership*, (2nd ed.) Jossey-Bass, San Francisco, CA, 1992, pp. xix, 418.
Schön, D.A. *The reflective practitioner: how professionals think in action* Basic Books, New York, 1983, pp. x, 374.
Schwartzman, H.B. *Ethnography in organizations* Sage Publications, Newbury Park, Calif., 1993, pp. ix, 83.
Star, S.L. "The Structure of Ill-Structured Solutions: Boundary Objects and Heterogeneous Distributed Problem Solving," in: *Readings in Distributed Artificial Intelligence,* M. Huhn and L. Gasser (eds.), Morgan Kaufman, Menlo Park, CA, 1989, pp. 37-54.
Star, S.L., and Griesemer, J.R. "Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology 1907-39," *Social Studies of Science* (19) 1989, pp 387-420.
Szulanski, G. "Unpacking stickiness: An empirical investigation of the barriers to transfer best practices inside the firm," *Academy of Management Journal* (Best Papers Proceedings 1995) 1995, pp 437-441.
Szulanski, G. "Exploring internal stickiness: Impediments to the transfer of best practice within the firm," *Strategic Management Journal* (17:Winter) 1996, pp 27-43.
Tolvanen, J.-P., and Lyytinen, K. "Modeling information systems in business development: alternative perspective on business process re-engineering," *IFIP Transactions: Computer Science and Technology* (A) 1994, pp 567-579.
Tolvanen, J.-P., Marttiin, P., and Smolander, K. "An integrated model for information systems modeling," Proceedings of the 1993 26nd Annual Hawaii International Conference on System Sciences, HICSS-26, Maui, HI, USA, 1993, pp. 470-479.
Van Maanen, J. "The Fact of Fiction in Organizational Ethnography," *Administrative Science Quarterly* (24) 1979, pp 539-550.
Van Maanen, J. *Representation in ethnography* Sage Publications, Thousand Oaks, Calif., 1995, p. 276.
Vitalari, N. "Knowledge as a Basis of Expertise in Systems Analysis: An Empirical Study," *MIS Quarterly* (9:3), September 1985, pp 221-241.
von Hippel, E. ""Sticky information" and the locus of problem solving: Implications for innovation," *Management Science* (40:4) 1994, pp 429-439.
Wastell, D. "Learning dysfunctions in information systems development: overcoming the social defenses with transitional objects," *MIS Quarterly* (23:4) 1999, pp 581-600.

Wenger, E. *Communities of practice: learning, meaning, and identity* Cambridge University Press, Cambridge, U.K. ; New York, N.Y., 1998, pp. xv, 318.
Zuboff, S. *In the age of the smart machine: the future of work and power* Basic Books, New York, 1988, pp. xix, 468.

Table 1. Practicing Reflexive Sociology

Guidelines for Reflexive Sociology	**Implementation in the Study**
Engage in self-reflection about the choice of the object of study and researcher's own social position (Bourdieu and Wacquant 1992: 234-238)	The choice of an Internet consulting company was motivated by my own IT consulting background, inter-organizational nature of projects, and an emphasis on innovation. I did not participate in the professional tasks as such participation would have necessitated me taking significant stakes in the field. I initially drew on my technical background and studies of science and technology (Star 1989; Star and Griesemer 1989; Carlile 1997; Bødker 1998), to ask what role models and diagrams (boundary objects) played in facilitating collaboration. However, data analysis indicated that these collaboration tools, while very important, enabled some study participants while constraining others (Orlikowski 1992). I moved my focus to understanding interests and conflicts in situations in which agents were engaged in different pursuits simultaneously.
Use multiple methods and levels of analysis to understand complex social dynamics (Bourdieu and Wacquant 1992: 227)	Because the study focused on understanding the everyday collaborative practices, I privileged contextually rich qualitative analysis (ethnographic field study) over larger scale quantitative analysis. However, I extensively used archival data especially data from the Human Resources database to situate my case within broader societal and historical forces.
Think relationally and avoid focusing on properties attached to individual and institutionalized groups (Bourdieu and Wacquant 1992: 226)	I compared several settings inside Eserve including the training program for new employees, the R&D group, and the project team. This paper focuses on the observations collected on the Eserve-Pubco project team, but is informed by my study of all settings. I followed examples of conducting comparative analysis, particularly relying on the "table of pertinent properties technique," found in Bourdieu's and his colleagues' empirical works (Bourdieu 1977; Bourdieu 1984; Bourdieu 1990; Bourdieu 1996).
Build a systematic model of a concrete empirical case (Bourdieu and Wacquant 1992: 234)	In my development of a systematic model, I followed inductive coding techniques (Glaser and Strauss 1967; Corbin and Strauss 1990), all of which are built on a systematic comparison of data.
Practice "radical doubt," so as to avoid "preconstructed" concepts and "misrecognition" of social order (Bourdieu and Wacquant 1992: 235.)	I drew on the principle of dialogic reasoning (Klein and Myers 1999) in practicing "radical doubt." According to this principle, data were subjected to a variety of possible interpretations, then further tested through subsequent data collection. The initial data collection and analysis began with the boundary object concept (Star 1989) and socio-cultural lens (Schein 1992). However, initial coding and analysis of the data soon revealed that alternative explanations and lenses were necessary. This led me to the introduction of several other lenses and, eventually, to Schön's (1983) reflection-in-action lens.

Table 2. Key Distinctions among Professional Groups at Eserve

Strategists	**Technologists**	**Graphic Designers**
Mostly Social Sciences or Humanities Majors	Mostly Technology or Science Majors	Mostly Design Majors
Mostly Top-ranked colleges	Mostly non-Top-ranked colleges	Mostly non-Top-ranked colleges
Mostly MBAs	Mostly non-MBAs	Mostly non-MBAs
Experienced in Management Consulting	New to Management Consulting	New to Management Consulting
Mostly unrecognized by outside professional community	Mostly unrecognized by outside professional community	Mostly recognized by outside professional community
Men and Women	Mostly Men	Men and Women

Table 3. Eserve vs. Pubco Fields Key Distinctions

Eserve Field Characteristics	**Pubco Field Characteristics**
Innovative, Small, New Firm	Traditional, Large, Established Firm
Promotion based on Years of Experience in the firm	Promotion based on Years of Experience in the industry
Mostly Technology, Social Science, Design Majors	Mostly Humanities Majors
Technological Expertise seen as a strategic competence	Technological Expertise seen as a supporting function
Management Positions occupied mostly by MBAs	Hardly Any MBAs in Management Positions
Old Age a Liability	Old Age an Asset
Salaries higher than average for person of a given age and level of education.	Salaries lower than average for a person of a given age and level of education.
Mostly Men	Mostly Women

Figure 1: Eserve Service Delivery Model Phases

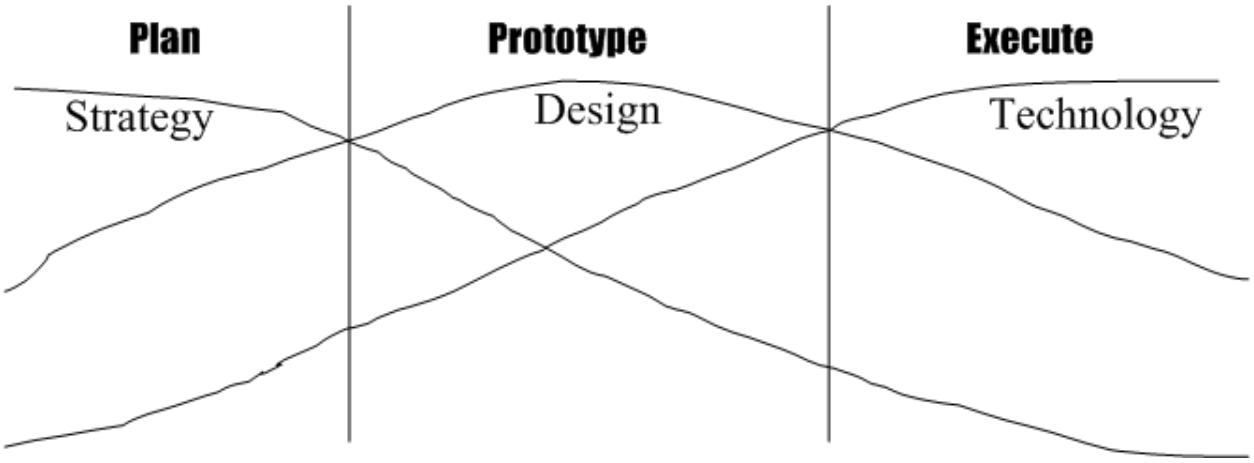

Figure 2. Eserve-Pubco Project Timeline

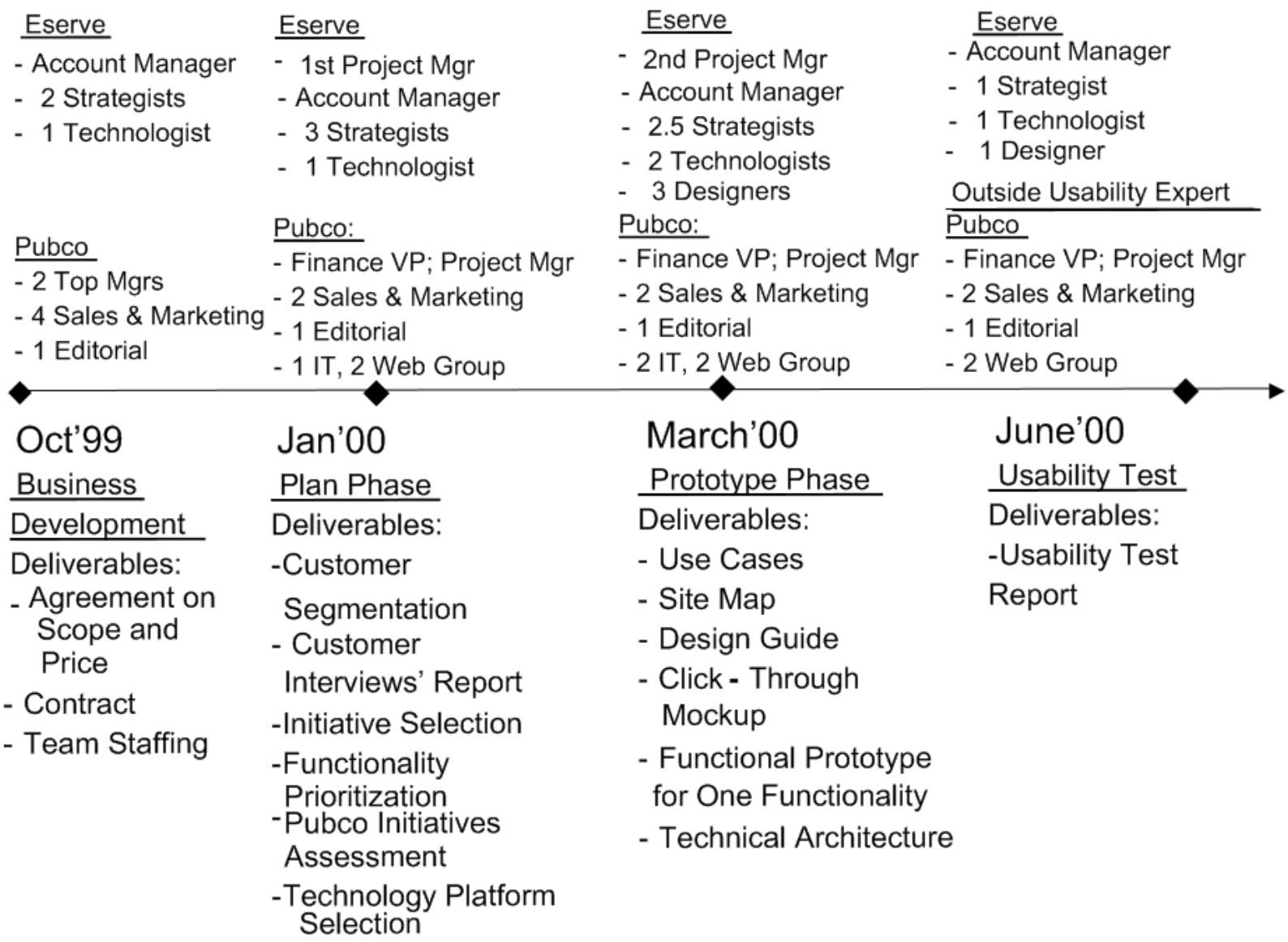

Figure 3: Structure of the Eserve-Pubco Field

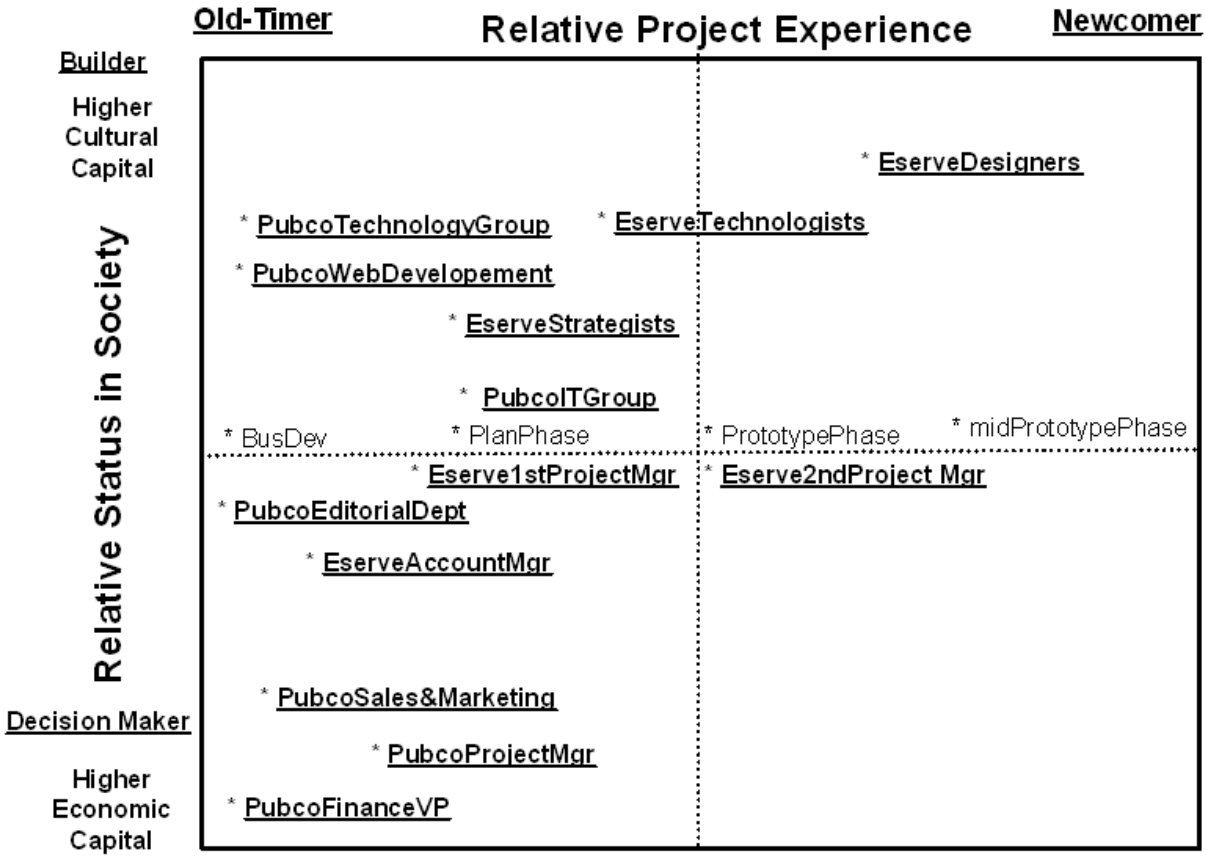

Figure 4: Collective Reflection-in-Action - Ignoring

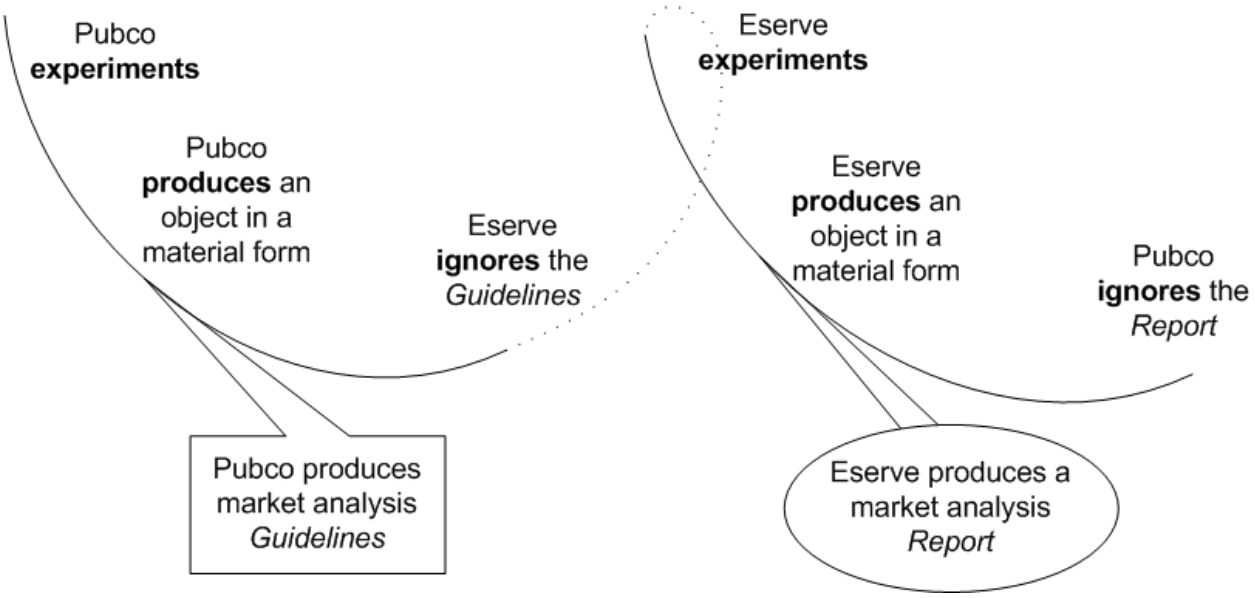

Figure 5: Collective Reflection-in-Action - Adding

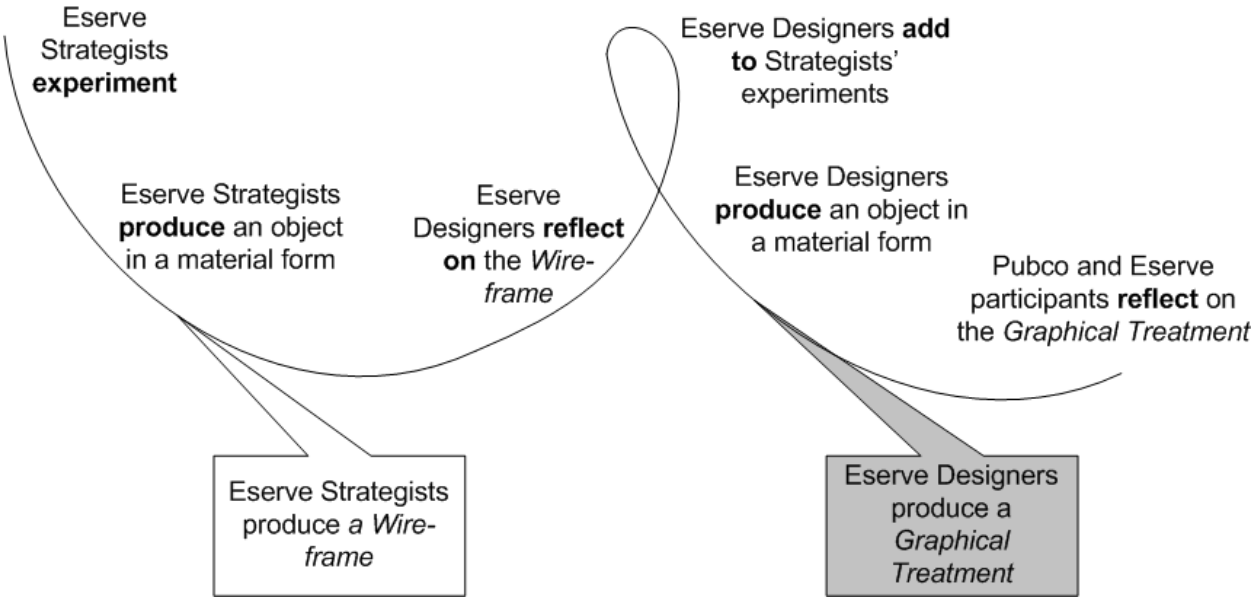

Figure 6: Collective Reflection-in-Action - Challenging

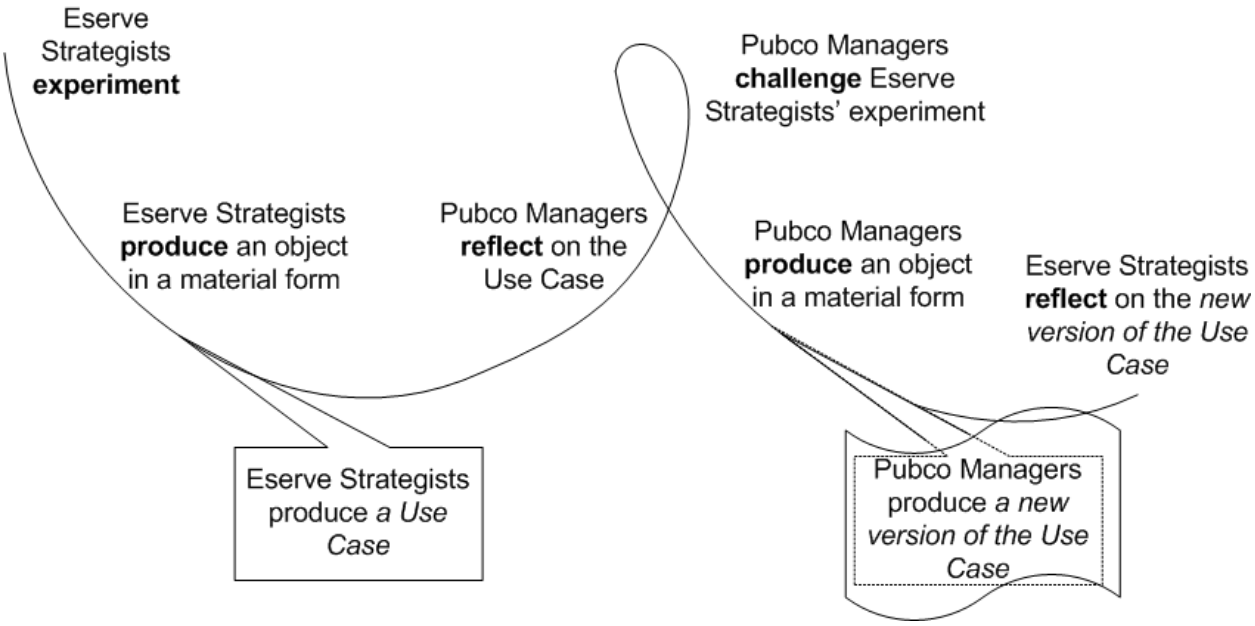

Figure 7: Collaborative ISD Practice: Theoretical Framework

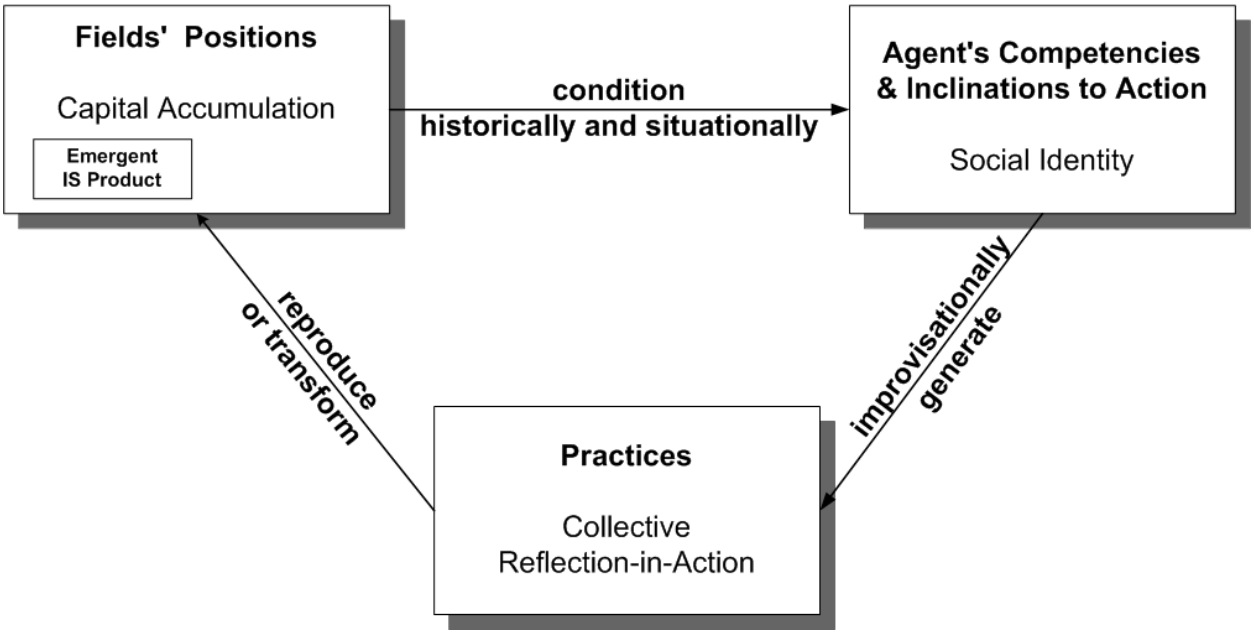

Figure 8: Steps in the Collective Reflection-in-Action Spiral