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# Collaborative Practices in Information Systems Development: A Collective Reflection-in-Action Framework

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# COLLABORATIVE PRACTICES IN INFORMATION SYSTEMS DEVELOPMENT: A COLLECTIVE REFLECTION-IN-ACTION FRAMEWORK

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## Abstract

*With the growth of consumer-faced information systems (IS) applications, IS designers are increasingly moving 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 the creation of professionally and organizationally diverse development teams with the goal of creatively combining individual competencies in the resultant product. This paper draws on the longitudinal field study of such a team in order to build a practice-based framework for understanding collaboration on IS development (ISD) projects. The framework depicts ISD as a collective reflection-in-action process that increasingly defines the product. The IS product is the result of participants iteratively challenging each other or following what has been already established on the project. Which action is taken is shaped by the status relations among professionally and organizationally diverse actors.*

## 1 INTRODUCTION

Information systems development (ISD) has always involved multiple stakeholders, but the information systems (IS) literature has traditionally focused on collaboration between two critical groups: technical developers and users (Boland 1979; Markus 1983; Orlikowski and Gash 1994). With the diversification of technical platforms, recognition of the strategic impact of IS, and more outsourcing, the diversity of stakeholders on ISD projects has increased significantly. Bringing together a diverse group of stakeholders is particularly prominent in the Web development arena because of the novelty of the activity, the pace of technical platform evolution, and the strategic role such systems play for many firms. People from different walks of life—business strategists, technologists, graphic designers, and marketers—need to work together to build new Web-based applications. Some of them, like strategy consultants, have often not participated in ISD before. Others, like artists, have often not worked in traditional corporations. At the same time, consumer-facing applications are drawing in a new audience of users—an audience with many more choices. Being outside the managerial control of corporations, these consumer-users cannot be ordered to use the system as many corporate users were (Zuboff 1988). Instead, consumer-users need to be enticed to use and transact with the system, making the resultant 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 *design* and *innovate* and with that goes acknowledgement of the need for new kinds of work practices.

Research into such work practices can be found in the literature on innovation and product development. One key conclusion of this research tradition is that settings combining diverse professional expertise (e.g., Grant 1996; Kogut and Zander 1992; Nonaka 1994; von Hippel 1988) and knowledge resources across organizations (e.g., Dyer and Singh 1998; Grant and Baden-Fuller 1995; Liebeskind et al. 1996; Powell et al. 1996; von Hippel 1994) create greater potential for innovative outcomes. This mentality is evidenced in modern ISD through 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 on such projects is even higher. This paper draws on insights from

an ethnographic field study of an outsourced Web development project to show how project-based collaboration of participants with diverse backgrounds shapes the resulting IS product. It illuminates how professional, status, and interorganizational differences become salient at different times on the project and how participant interaction shapes the emergent product. It concludes that the degree of novelty in the outcome is influenced by participants challenging each other while producing the product.

The paper begins with an overview of relevant IS and new product development literature. Next, the method of the study is described. The findings section overviews the study's setting, articulates the theoretical framework of collective reflection-in-action, and offers some supporting evidence from the study. The full study can be found in Levina (2001). The paper concludes by outlining some implications for practice and future research in ISD and innovation management.

## 2 BACKGROUND RESEARCH

IS researchers have investigated various aspects of diversity of backgrounds brought to bear on IS projects. As already noted, IS research has focused primarily on 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., Bødker 1999; Kyng 1995; Rossi et al. 2000; Tolvanen et al. 1993). Drawing on this tradition, researchers also explored how distinctions among users shaped the emergent IS product: managers versus line workers (e.g., Bødker et al. 1988), hospital administrators versus doctors versus nurses (Bloomfield and Coombs 1992), aircraft commanders versus 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 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 (1996) and her colleagues (Kirsch et al. 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. The 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 toward control have low explanatory power, instead arguing that consultants have power to block clients' involvement. This somewhat contradicts Kirsch et al.'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 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 versus developers, managers versus end users, expert versus novice developers, or business clients versus 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 (Bødker et al. 1988; Boland 1979; Markus 1983; Markus and Bjørn-Andersen 1987; ), but primarily in the context of users/managers versus 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, research and development (R&D), production, and manufacturing units in organizations (Bechky 1999; Carlile 2002; Dougherty 1992a, 1992b) and within professionally diverse R&D teams (Hargadon 1998; Hargadon and Sutton 1997; 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., Bødker 1998; Tolvanen and Lyytinen 1994) 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 closer attention to the interests and conflicts that arise on such projects and to the role of objects in such practices.

### 3 RESEARCH METHODS

Theorizing about collaboration calls for a close examination of the everyday practice of individuals involved in it (Bourdieu 1977; Carlile 2002). Such examination is best provided by the contextually rich qualitative data, which, in this case was obtained from an ethnographic field study (Agar 1980; Van Maanen 1979) of an Internet consulting company (Eserve) and one of its clients (Pubco)<sup>1</sup> conducted over a 9 month period. Detailed observations and document analysis were supplemented with 41 in-depth interviews with participants. The interpretive account of the setting was supplemented with an archival analysis of relevant documents. Data collection and analysis were guided by principles of reflexive sociology (Bourdieu and Wacquant 1992). Archival analysis provided an understanding of the history and the rewards structure of the industries and organizations involved, which were only partially visible from the qualitative data. The data was used to build an inductive model (Glaser and Strauss 1967) of the Eserve-Pubco project case. The inductive, grounded model was subject to multiple theoretical interpretations to understand how collaboration shaped the IS product (Bourdieu and Wacquant 1992; Klein and Myers 1999).

Interpretive research methods (Klein and Myers 1999; Schultze 2000) and principles of reflexive sociology require that a researcher engages in self-reflection about his/her role and the choice of the object of study. I chose to look at the collaboration in ISD due to my own background in IS consulting practice. An Internet consulting company was particularly interesting because of the entrance of graphical designers into that ISD. I entered the field as a non-participant observer in late 1999 when Internet consulting was on the rise. I spent four to five days a week (about 6 hours a day) in different settings at Eserve and Pubco resulting in 20 to 40 pages of typewritten notes a day (this paper reports primarily on the Eserve-Pubco project). Initially I drew on my technical background and literature on product development (Carlile 2002), which suggested that models and diagrams played important roles in facilitating collaboration. I soon learned that the production of these communication tools enabled some study participants, while constraining others (Orlikowski 1992). I thus focused on understanding the power dynamics of the situation in which participants were engaged in different pursuits simultaneously. Finally, as a technologist, I was at first more attuned to the interests of the technical professionals, but through content analysis of data (Agar 1980) was able to understand the struggle of different professional groups and organizations.

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 versus answered questions, etc. Descriptions of collaborative practices (meetings, e-mail 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 customer 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, differences could be explained by examining the traditional role of clients, who pay the bills, versus consultants, who do the work.

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<sup>1</sup>Eserve and Pubco are pseudonyms.

Then, using the second key technique, the creation of the “tables of pertinent properties of a set of participants” (Bourdieu and Wacquant 1992, p. 230), the analysis of conflicts was traced back to participants’ relative positions vis-à-vis IS development practices. The technique involved recording properties of participants who were directly or indirectly involved in the study in a table. For example, these properties included participant’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 styles 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, the reduction allowed comparison of different groups’ practices along key dimensions to explain conflicts and conflict resolutions that I observed in the field. For more details see Levina (2001).

## 4 THE FIELD STUDY FINDINGS

### 4.1 Eserve and Pubco

In 1999, Eserve was a young, rapidly growing professional services firm engaged in end-to-end production of business to consumer (B2C) Web applications for clients. The message flashing at visitors in Eserve’s lobby described Eservers as fast and fearless. Eserve was extremely successful both on Wall Street and with clients, receiving a 90 percent client satisfaction rating in a third party survey. Historically, Eserve started by providing technical Web development services. It soon added strategic consulting expertise, hiring MBAs and consultants from big consulting firms. In mid-1997, responding to competition from graphical design and advertising agencies, it added graphical design and marketing specialists to its teams. Eserve saw 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 12 x 12 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, and a great social climate (working among friends). Team members on ISD projects were literally rubbing shoulders in a no walls, open space environment, where even the senior managers had no offices. However, Eserve did have an acknowledged hierarchical structure for teams and had clearly defined branch and firm leadership. Eserve greatly rewarded tenure in the firm and Eserve old-timers were quickly promoted to leadership positions. Strategists and old-timer technologists occupied key project and firm leadership positions. There was almost no career ladder for graphical designers. Outside industry experience, unless it was in the “Web space,” was heavily discounted in assigning project roles. For example, a renowned brand specialist would work in the same position on the project as a Web-space graphical designer 5 years out of school. A key characteristic of Eserve projects was its three phases (depicted in Figure 1): planning phase led by strategists with few designers and technologists; prototype phase, which involved more designers and fewer strategists, and implementation phase led by technologists. While Eserve valued collaboration with the client, its methodology assumed that clients coming from traditional organizations knew little about the Web space and needed be heavily guided.

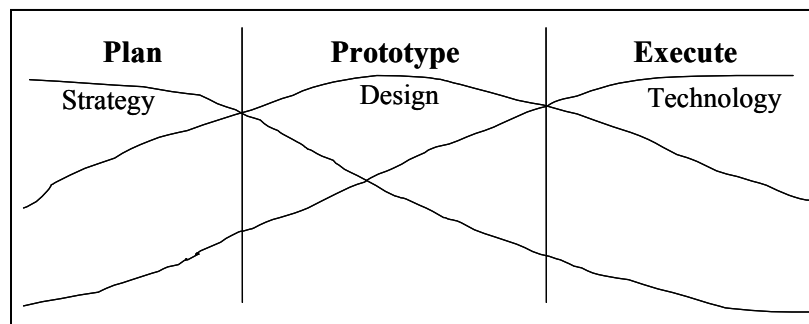


Figure 1. Eserve Service Delivery Model Phases

Pubco was a traditional, multidivisional publishing company based in the United States. It had strong hierarchical and departmental distinctions. Promotion at Pubco was directly related to years spent in the publishing industry. The IT department was seen as supporting functions for finance and editorial units.

While Pubco has had a Web presence for several years, its 100+ page Internet site had been growing without any overarching business or brand strategy. Pubco had, therefore, partnered with Eserve to address this problem, which was especially acute in the area of site usability. The Eserve-Pubco project involved designing digital strategy (planning phase, 2 months), redesigning old and developing new Web functionality (prototype phase, 3 months), and implementing the site (implementation phase, 6 months). Pubco officials approached the project cautiously. Based on prior experiences with management consultants, they believed that consultants had to be closely supervised to be beneficial to Pubco.

## 4.2 Eserve-Pubco Project

Eserve and Pubco exhibited signs of conflict early on. The first two phases of the project, which I observed directly, involved six to eight Eserve consultants, five or six Pubco business managers and three or four IT people, who would meet with Eserve several times a week. The interactions of participants on the project were largely shaped by their initial relative resources, such as Pubco's control over economic resources (because they paid the bills) and Eserve's control over intellectual resources (because they had a reputation in building Web sites). One of the early conflicts, for example, surrounded the issue of whether clients should take part in interviewing potential site users to solicit feedback from more users given limited Eserve resources. However, despite the emphasis on collaboration and joint work, clients believed gathering such information was the responsibility of the consultants. Given the consultants' limited resources, only a dozen or so interviews were conducted. Another conflict developed because, initially, the consultants hardly read any documents given to them by the clients, instead trying to learn about the publishing business on their own by visiting other publisher's Web sites and reading press and financial reports. Web-space strategy consultants believed that they could be more innovative if they took a fresh perspective, not one generated by Pubco. The clients were appalled by Eserve paying so little attention to Pubco's prior work, and threatened to abandon the project—to withdraw their economic resources.

Within the Eserve and Pubco teams, Eserve strategists and Pubco managers had decision-making authority over key project decisions. It was they who guided the initial structure of the project and made critical decisions such as which design methodology to follow, which Web-based strategic initiatives should be considered, and how they should be prioritized, exerting critical influence over the emergent product. Eserve strategists also played a crucial role in defining the product since following Eserve's methodology they were involved on the project from the beginning and were constantly interacting with the client. Two technologists and one half-time marketing specialist barely participated in decision making during the planning phase. Two graphical designers who joined the project in the prototype phase and were new to Eserve, new to the team, and new to business consulting, were at a significant disadvantage. They were lost in the terminology and direction of the project. They had no control over key resources or decisions, yet it was a critically stated objective of the project to implement a graphically sound and innovative Web site.

## 4.3 Collective Reflection-in-Action Spiral

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

*Reflection-in-action* is a concept proposed by Schön (1983) to understand how individual professionals address uncertain and non-routine, yet repetitive, problems in practice (p. 60). Reflection-in-action is a reflective “conversation with the material of a situation” (p. 79). “The unique and uncertain situation comes to be understood through the attempt to change it, and changed through the attempt to understand it” (p. 131). Experimentation does not assume novelty. It is an action taken so as to see and evaluate its outcomes (p. 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 (p. 135). In this paper, 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 multiparty collaboration indicated an important difference between individual versus 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.”

Based on the data, I classified 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 used 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 participants felt that their authority in controlling the project was challenged. Pubco reestablished its authority by ignoring the results of Eserve’s market analysis and prioritizing its own Web site initiatives. Figure 2 reflects the break in the collective reflection-in-action spiral in the case of *ignoring*.

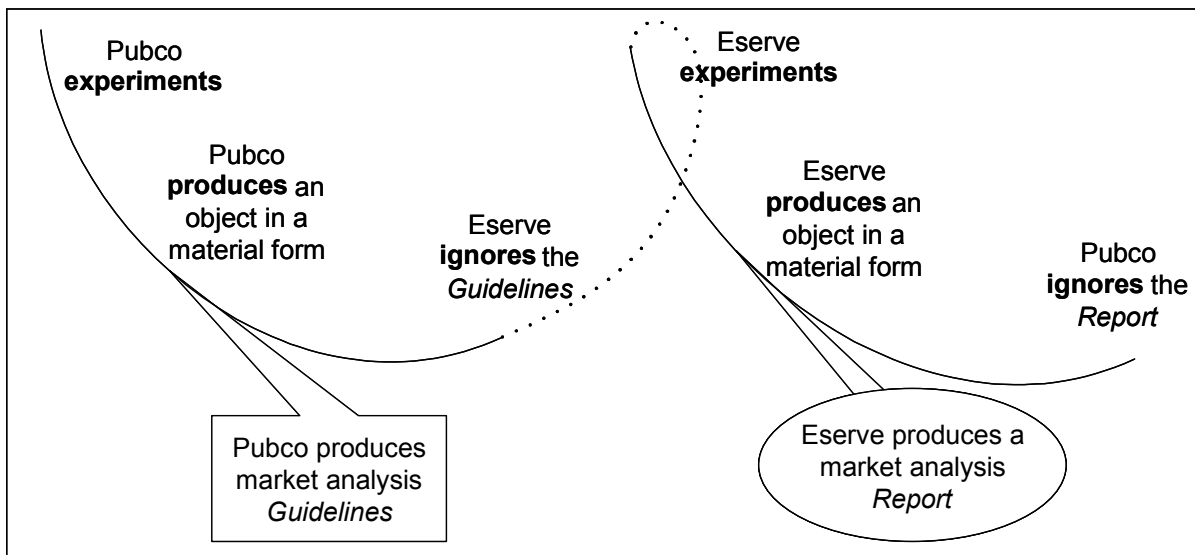


Figure 2. Collective Reflection-in-Action—Ignoring

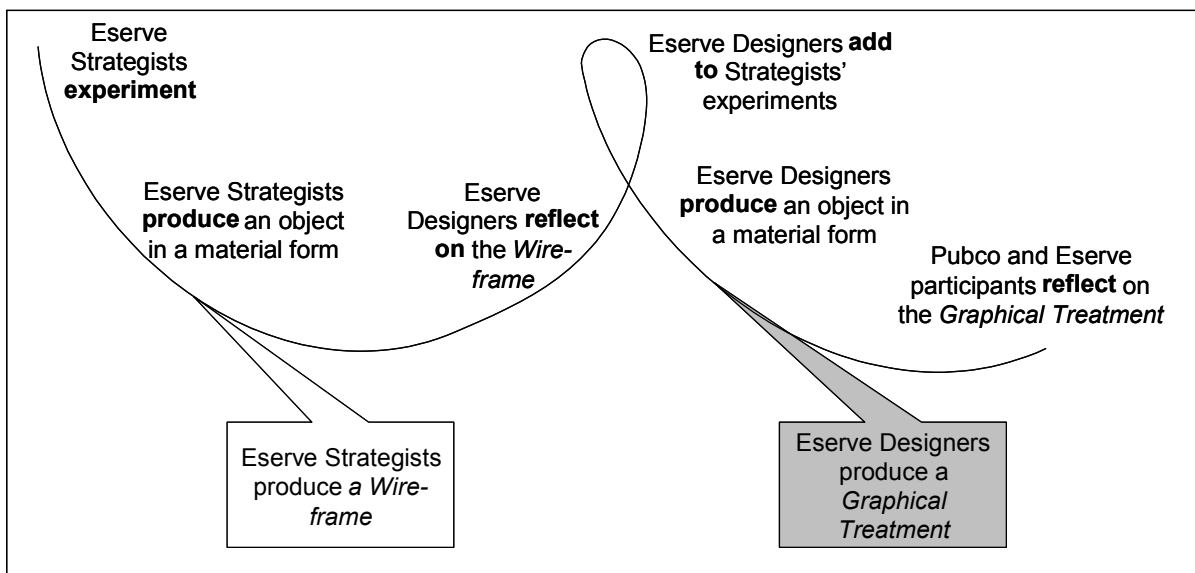


Figure 3. Collective Reflection-in-Action—Adding

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, they primarily followed the strategists' lead and added graphical design to specifications provided by strategists. Because the designers joined the project late, they lacked critical competence on the project: the knowledge of decisions made earlier about the emergent IS product. Thus, when the time came for them to develop graphical designs for the site, their initial offerings were quickly dismissed by the strategists because the designers showed incompetence in the client's business. Instead, the strategists provided the designers with bare bones sketches of the pages (Wire Frames), which the 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. Figure 3 reflects an example of the collective reflection-in-action spiral in the case of adding.

When repeated multiple times, the 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's 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 in 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 the strategists took the lead.

The execution mode of collaborative experimentation has limited potential for innovation, but is likely to lead to timely project completion and preservation of the status quo in project 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 actor involved in challenge type collaboration fails (i.e., their experimentation is ignored), their power position 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. Eserve team members 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 the problems were not fixed in a rush to complete the project phase on time.

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 4 reflects an example of the collective reflection-in-action spiral in the case of challenging.

## 5 Implications and Contributions

The collective reflection-in-action lens presented here helps us in further opening the black box of ISD and seeing how the product is actually shaped through the sharing of system representations (objects) produced by participants. Figure 5 depicts a more conceptual version of the collective reflection-in-action spiral, which might be usefully applied to other IS development and implementation settings.

In relation ISD practice, this framework shows that IS products are shaped by the interaction of participants on the ISD team. This interaction is, in turn, shaped by the relative power of participants on the project. Participants with control over economic resources (business clients and project managers) play a crucial role in defining goals and priorities for the project, selecting methodologies, and staffing. In this way, they can facilitate more or less innovative outcomes. If there is an explicit recognition of the need to integrate new expertise into the product, managers may want to allocate resources to challenge type experimentation (which involves partial undoing of what has been produced thus far). Empowered actors may want to share control over projects with those whose competence is critical for the project and involve those participants early on so that they can lead the product design. Such power sharing may be justified by the potential for economic gains if the product becomes a successful innovation.



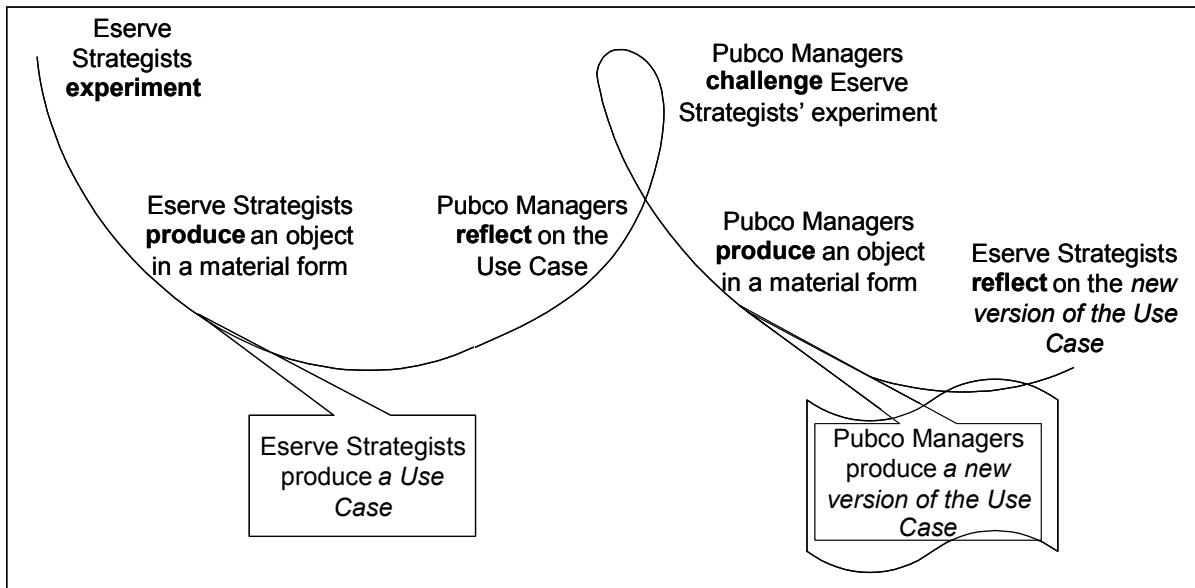


Figure 4. Collective Reflection-in-Action—Challenging

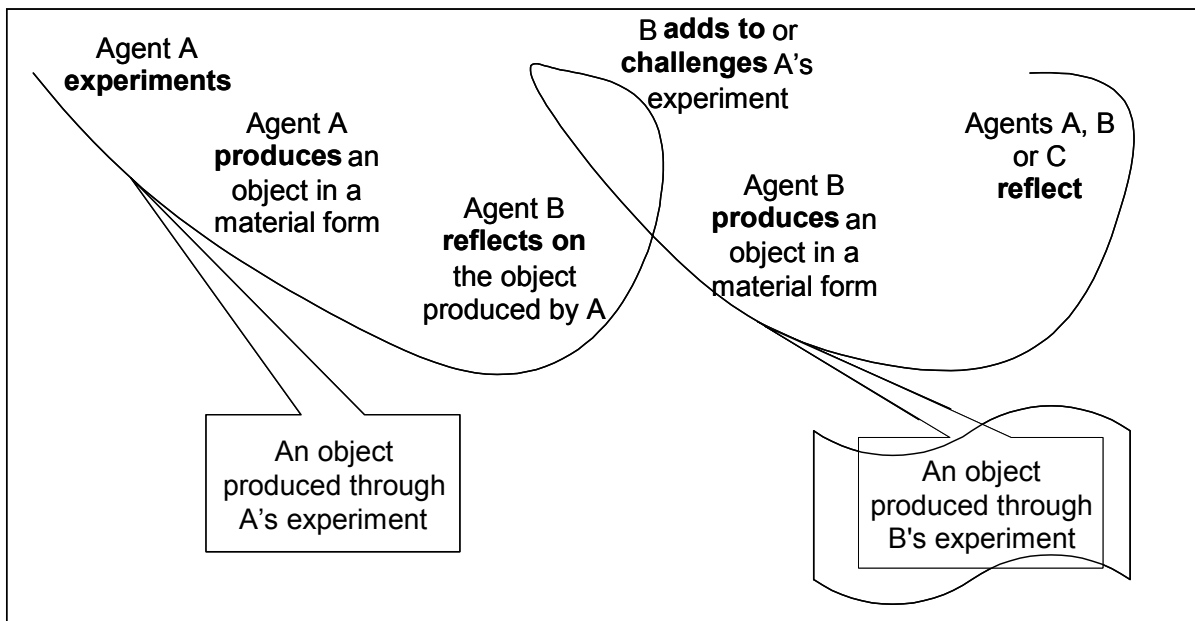


Figure 5. Steps in the Collective Reflection-in-Action Spiral

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). 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 fruitfully applied to analyzing not only individual, but collaborative practices. The 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.

The IS literature has traditionally examined interests and practices involved in user-designer collaboration. There is little work, however, on the implications of distinctions among developers. Traditional project management literature looked at software engineering as a guide for running collaborative projects (Kemerer 1997). However, engineering approaches are rarely invoked on projects where technologists are in the minority, which is increasingly the case in the early development stages of Web-based applications. The IS outsourcing literature acknowledges that the ability to collaborate affects outsourcing outcomes (Kern 1997; Koh et al. 1999), yet it does not focus on the actual practices and outcomes involved in bridging the organizational boundaries. Moreover, the literature on business client involvements in ISD practices (Kirsch et al. 2002) does not directly generalize to outsourced contexts. The work presented here makes a contribution toward filling these gaps. While the paper is limited in that it draws from on a single field study, it elicits issues of power and expertise coordination that are common in other practice settings (Bourdieu and Wacquant 1992). Future work should provide further insights into the nature of power dynamics in collaborative settings and how such dynamics shape outcomes.

## 6 REFERENCES

- Agar, M. *The Professional Stranger: An Informal Introduction to Ethnography*. New York: Academic Press, 1980.
- 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*. Englewood Cliffs, NJ: Prentice Hall, 1990.
- Bechky, B. A. *Crossing Occupational Boundaries: Communication and Learning on a Production Floor*. Unpublished Ph.D. Dissertation, Stanford University, 1999.
- 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. "Scenarios in User-Centred Design—Setting the Stage for Reflection and Action," in *Proceedings of the 32<sup>nd</sup> Annual Hawaii International Conference on System Sciences*. Los Alamitos, CA: IEEE Computer Society Press, 1999, p. 124.
- Bødker, S. "Understanding Representation in Design," *Human-Computer Interaction* (13:2) 1998, pp. 107-125.
- Bødker, S., Ehn, P., Knudsen, J., Kyng, M., and Madsen, K. "Computer Support for Cooperative Design," in *Proceedings of the Conference on Computer-Supported Cooperative Work*. New York: ACM Press, 1988, pp. 377-394.
- Boland Jr., R. J. "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, England: Cambridge University Press, 1977.
- Bourdieu, P., and Wacquant, L. J. D. *An Invitation to Reflexive Sociology*. Chicago: University of Chicago Press, 1992.
- 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.
- 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. 77ff.
- 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 Aartifacts*. Stockholm: Arbetslivscentrum, 1988.
- Faraj, S., and Sproull, L. "Coordinating Expertise in Software Development Teams," *Management Science* (46:12), December 2000, pp. 1554-1568.
- 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," in V. Storey, S. Sarkar, and J. I. DeGross (eds.), *Proceedings of the 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*. Chicago: Aldine Publishing Company, 1967.
- 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.
- Hargadon, A. B. "Firms as Knowledge Brokers: Lessons in Pursuing Continuous Innovation," *California Management Review* (40:3) 1998, pp. 209-227.

- Hargadon, A., and Sutton, R. I. "Technology Brokering and Innovation in a Product Development Firm," *Administrative Science Quarterly* (42:4) 1997, pp. 716-749.
- 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.
- Kemerer, C. L. *Software Project Management*. New York: McGrawHill, 1997, p. 214.
- Kern, T. "The Gestalt of an Information Technology Outsourcing Relationship: An Exploratory Analysis," in K. Kumar and J. I. DeGross (eds.), *Proceedings of the Eighteenth International Conference on Information Systems*, Atlanta, GA, 1997, p. 37-58.
- Kirsch, L. J. "The Management of Complex Tasks in Organizations: Controlling the Systems Development Process," *Organization Science* (7:1) 1996, pp. 1-21.
- 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.
- 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," in P. De and J. I. DeGross (eds.), *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," *Communications of the ACM* (38:9), 1995, pp. 46-56.
- Lanzara, G., and Mathiassen, L. "Mapping Situations Within a Systems Development Project," *Information and Management* (8) 1985, pp. 3-20.
- Leonard, D., and Swap, W. C. *When Sparks Fly: Igniting Creativity in Groups*. Boston: Harvard Business School Press, 1999.
- Levina, N. "Sources of Vendor Production Cost Advantages in IT Outsourcing," Working Paper, Center for Information Systems Research, MIT Sloan School of Management, Cambridge, MA, 1999.
- Levina, N. *Multi-Party Information Systems Development: The Challenge of Cross-Boundary Collaboration*. Unpublished Ph.D. Dissertation, Sloan School of Management, Massachusetts Institute of Technology, 2001.
- Liesbeskind, 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," in *Proceedings of the Conference on Computer-Supported Cooperative Work*. New York: ACM Press, 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 Bjørn-Andersen, N. "Power Over Users: Its Exercise by System Professionals," *Communications of the ACM* (30:6), June 1987.
- 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.
- Pawlowski, S. D., Robey, D., and Raven, A. "Supporting Shared Information Systems: Boundary Objects, Communities, and Brokering," in W. J. Orlikowski, S. Ang, P. Weill, H. Krcmar, and J. I. DeGross (eds.), *Proceedings of the 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," in *Proceedings of the 33<sup>rd</sup> Annual Hawaii International Conference on System Sciences*. Los Alamitos, CA: IEEE Computer Society Press, 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.
- Schön, D.A. *The Reflective Practitioner: How Professionals Think in Action*. New York: Basic Books, 1983.
- Schultze, U. "A Confessional Account of an Ethnography About Knowledge Work," *MIS Quarterly* (24:1) 2000, pp. 3-41.
- 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.

- Tolvanen, J.-P., and Lyytinen, K. "Modeling Information Systems in Business Development: Alternative Perspective on Business Process Re-engineering," in B. C. Glasson, I. T. Hawryszkiewicz, B. A. Underwood, and R. A. Weber (eds.), *Business Process Re-Engineering*. Amsterdam: North-Holland, 1994, pp. 567-579.
- Tolvanen, J.-P., Marttiin, P., and Smolander, K. "An Integrated Model for Information Systems Modeling," in *Proceedings of the 26<sup>th</sup> Annual Hawaii International Conference on System Sciences*. Los Alamitos, CA: IEEE Computer Society Press, 1993, pp. 470-479.
- Van Maanen, J. "The Fact of Fiction in Organizational Ethnography," *Administrative Science Quarterly* (24) 1979, pp. 539-550.
- 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. *The Sources of Innovation*. New York: Oxford University Press, 1988, pp. xi, 218.
- Von Hippel, E. "'Sticky information' and the Locus of Problem Solving: Implications for Innovation," *Management Science* (40:4) 1994, pp. 429-439.
- Zuboff, S. *In the Age of the Smart Machine: The Future of Work and Power*. New York: Basic Books, 1988.