

Collaborative Organization and Interactive Technologies

David Stark
Center on Organizational Innovation
Columbia University

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At mid-century, organizational analysts at Columbia University led by Robert Merton and Paul Lazarsfeld launched two ambitious research programs. On one track, Merton and his graduate students Peter Blau, Alvin Gouldner, and James Coleman examined the origins and functioning of bureaucracy using a rich repertoire of methods including small group analysis, ethnography, and survey research. On the second, parallel, track Merton and Lazarsfeld established the Bureau of Radio Research to examine the dynamics of mass communication. Methodological pioneers, they developed the focus group method and used projection booths to study the demographics of audience reception well before their colleagues in comparative literature discovered “reception theory.”

Whereas my Columbia predecessors charted the rise of bureaucratic organizations and the emergence of mass communication, we have a new opportunity, at our century’s turn, to *chart the emergence of collaborative organizational forms in an era of interactive media*. But the analogy holds only to a point: if Merton and Lazarsfeld could pursue their twinned projects in parallel, ours must be conjoined in an era when questions of organizational design are closely related to design of the digital interface. The research projects I am pursuing take up this challenge.

Since arriving at Columbia in 1997, I have developed my earlier work on organizational innovation (in the contexts of socialist, and later, postsocialist Eastern Europe) in new directions that take advantage of field research opportunities in New York City. Before describing the specific research, I locate these empirical investigations in terms of their theoretical contributions to organizational analysis and economic sociology.

Conceptual framework: Heterarchies

As the counterpart to the bureaucratic and hierarchical organizations that were dominant in Merton’s epoch, I have been engaged in a task of concept formation to illuminate new organizational forms that I label *heterarchical*.

Mid-century, there was general consensus about the ideal attributes of the modern organization: it had a clear chain of command, with strategy and decisions made by the organizational leadership; instructions were disseminated and information gathered up and down the hierarchical ladder of authority; design preceded execution with the latter carried out with the time-management precision of a Taylorist organizational machine. By the end of the century, the main precepts of the ideal organizational model would be fundamentally rewritten. The primacy of relations of hierarchical *dependence* within the firm and the relations of market *independence* between firms became secondary to relations of *interdependence*

among networks of firms and among units within the firm. As one indicator of the extent to which firms are redrawing their boundaries, some refer to "mobius-strip organizations" -- recalling the unique features of a topology without an inside and an outside. Others document new kinds of "hybrids," "strategic alliances," and "symbiotic arrangements." I refer to this ensemble of new organizational forms as heterarchies.

Heterarchies are self-organizing, non-hierarchical systems that are characterized by lateral accountability and by organizational heterogeneity. Heterarchy involves distributed intelligence and the organization of diversity. Restated, heterarchies encompass multiple communities of knowledge and practice that subscribe to diverse evaluative and performance criteria and answer to different constituencies and principles of accountability.

Heterarchy's twinned features are a response to increasing uncertainty in the organizational environment. Under complex strategy horizons, where dislocations can be anticipated in general but are unpredictable in their specific contours, organizations must innovate in ways that allow them to flexibly redeploy resources for further innovation. To cope with radical uncertainties of market volatility and rapid technological change, instead of concentrating its resources for strategic planning among a narrow set of senior executives or delegating that function to a specialized department, firms may undergo a radical decentralization in which virtually every unit becomes engaged in innovation. That is, in place of specialized search routines in which some departments are dedicated to exploration while others are confined to exploiting existing knowledge, the functions of exploration are generalized throughout the organization.

These developments increase interdependencies between divisions, departments, and work teams within the firm. But because of the greater complexity of these feedback loops, coordination cannot be engineered, controlled, or managed hierarchically. The results of interdependence are to increase the autonomy of work units from central management. Yet at the same time, more complex interdependence heightens the need for fine-grained coordination across the increasingly autonomous units. The coordination of this distributed intelligence is achieved through distributed authority in which authority is no longer delegated vertically but rather emerges laterally. As one symptom of these changes, managers socialized in an earlier regime frequently express their puzzlement to researchers: "There's one thing I can't figure out. Who's my boss?" Under conditions of distributed authority, managers might still "report to" their superiors; but increasingly, they are accountable to other work teams.

The challenge of the modern firm, whether it be a postsocialist firm coping with the uncertainties of system change or a digital technologies firm coping with unpredictable strategy horizons, is the challenge of building organizations that are capable of learning. Flexibility requires an ability to re-cognize, redefine, recombine and redeploy assets: in short, a pragmatic reflexivity.

This capacity for self-redefinition is grounded in the organizational heterogeneity that characterizes heterarchies. Heterarchies are *complex* adaptive systems because they interweave a multiplicity of organizing principles. The greater interdependence of increasingly autonomous work teams results in a proliferation of performance criteria. Distributed authority not only implies that units will be accountable to each other, but also that each will

be held to accountings in multiple registers. Firms must foster a sufficiently common culture to facilitate communication among the designers, business strategists, engineers, marketers, technologists, scientists that make up interdisciplinary teams – without suppressing the distinctive identities of each. A robust, lateral collaboration flattens hierarchy without flattening diversity. Heterarchies create wealth by inviting more than one way of evaluating worth.

Empirical research

I am investigating the co-evolution of organizational forms and interactive technologies in five field settings.

New media firms. My first research site was chosen with the premise that the new social engineers of the era of interactive technology are software engineers, interactive designers, and information architects. What better place to start than by studying the socio-technical relations of a new media firm. For more than two years, with anthropologist Monique Girard, I was engaged in ethnographic fieldwork in NetKnowHow, a pseudonym for a leading full service Internet consulting firm located in the Flatiron District at the heart of Manhattan's Silicon Alley.

Our research followed these web developers up the course of the dot.com boom and through the subsequent downturn. The major focus was on processes of collaboration across the “disciplinary” boundaries of programmers, designers, and business strategists each with their own distinctive identities and performance criteria. Building a sophisticated e-commerce site (frequently priced in the seven figures) is a complex task – one all the more challenging when the very definitions of the internet and the industry themselves are under construction.

In our fieldwork we are examining, for example, how extraordinarily tight deadlines means that production begins before design is completed. The consequence is that programmers, designers, and information architects are engaged in simultaneous rather than sequential engineering. The more the site they are constructing is truly interactive, the more the various parts of the project team must interact. The more the intelligence of the site is distributed – including, most critically, the user's intelligence – the more the construction site must use a distributed intelligence among the team in collective problem solving. The more they must take into account how their actions will shape the parameters of others, the more they must increase the lines of lateral accountability. As a young programmer explained to us in an apt epigram for collaborative engineering: “In this company, I'm accountable to everybody who counts on me.”

At the same time that these web developers are constructing interactive technologies, they are also using them. And so our study also includes investigation of patterns of communication within the firm. Why, for example, does someone use Instant Messaging to communicate with the person at the immediately adjacent workstation? For what kinds of questions is email (telephone, face to face, intranet, bulletin board, etc.) the preferred channel? And what does choice of channel signal about the sender's expectations about the respondent's reply?

Electronic trading rooms. My second field research setting is an electronic trading room that was located in the World Financial Center (WFC) in Manhattan's Financial District. With one of my graduate students, Daniel Beunza, I have been conducting research on socio-technical networks in the trading room of a major international investment bank. To summarize all too briefly our major findings: As increasingly more information is almost instantaneously available to ever-wider groups of investors, this trading room makes profits not by access to better or more timely *information* but by producing a community of *interpretation*.

Initially, we saw this research setting as providing a straightforward contrast to the new media firm. Among these sophisticated derivatives traders, we thought, there would be a single metric of performance, a premium on information, and an emphasis on risk and calculability. But the more we studied the actual dynamics, the more we became aware that, alongside the shared metric that a trader's value could be measured by the profitability of his "book," there were contending performance criteria for measuring the value of a model of the market. That is, your model (perhaps even one codified into an algorithm for automated trading) might be losing money in the short run but is, nonetheless, a valid representation capable of performing well in the long run. In analyzing the actual processes whereby traders construct these models, "test" them, and repair them, our attention turned to the importance of the spatial configuration of the trading room. Space becomes a means of organizing diversity among heterogeneous communities of interpretation; and the trading room pulses with the tensions between risk versus uncertainty, information versus interpretation, and calculation versus judgment.

Our research at the WFC was interrupted by the September 11th attack on the World Trade Center. But our research in the trading room, subsequently relocated to New Jersey, has continued unabated. Within only six days, the firm was trading again when markets reopened on September 17th, and we were back in the room that same week observing as the traders placed a sign "20th Floor Securities" above their desks on the ground floor of the converted warehouse where the firm relocated.

Although different from those of police and firefighters, the traders' story is also, in its own way, one of loss and pain. We feel very honored that the traders invited us back so soon after the attack to observe the process of recovery. As it unfolds, we will have extraordinary data on how socio-technical networks are reconstructed after catastrophe. "Technology," writes Bruno Latour, "is society made durable." But what happens when technology breaks down, when traders who were accustomed to twenty dedicated phone lines apiece must share phones, when traders whose style of trading is based on speed and volume must suddenly operate with minimal bandwidth?

Already before September 11th, new information and interactive technologies were reshaping the financial district. With the path dependent effects of co-location suddenly broken, will many firms take advantage of new technologies to further decentralize? Will the micro-spatial features that give rise to trading rooms continue to aggregate across firms to rebuild Wall Street, or will they combine with new technologies in a centrifugal process that replicates trading rooms dispersed away from the core financial district? During the first week after the attack, our informants were referring to themselves as "Wall Street traders in

New Jersey.” But more recently, many are questioning the need to return to the financial district and an internal debate is intensifying. Our case study will yield detailed observations at the microcosm that will illuminate fundamental processes of place and space in the New York City economy.

Sociotechnical networks in response and recovery. On the evening of September 11th, the managers and information technology specialists of the trading room we had been studying estimated that it would take three weeks to three months to begin trading. Six days later, when equity markets opened on September 17th, they were trading. How was this accomplished? During Fall 2001, I explored this question not only at pseudonymous International Securities but also at other effected firms. With some of my students we began talking with people in firms, large and small, individually and in groups. On December 5th, we convened a closed meeting here at Columbia University with executives and IT officers from firms such as Merrill Lynch, Deutsche Bank, Cantor Fitzgerald, Sun Microsystems, SunGard, and Fred Alger Associates, among others.

Although the initial motivation of our research was to explore the role of technology in recovery, our research revealed the importance of strong personal ties that extended laterally in these organizations. The interface, I learned, is not a boundary but a border that is itself both technological and human. I am currently writing a paper that examines the importance of preparedness and self-organization, of planning and spontaneity. It draws parallels between the organizational features that promote recovery and those that promote innovation.

An online public forum. The violent assault upon lower Manhattan on 9/11 had the unintended consequence of reinvigorating our sense of common civility and renewing our appreciation for our city’s resourcefulness and resilience. People who live and have been touched by New York have expressed a need and a desire to take part in the process of rebuilding our city. Throughout the city, conversations involving private, public, and voluntary associations elaborate visions and debate priorities for New York’s future development.

My center (the Center on Organizational Innovation) and the Urban Planning Program at Columbia University are collaborating to build an on-line public policy forum, evolvenewyork.org, that will focus on the redevelopment of lower Manhattan in the aftermath of 9/11. The web site will serve as an information clearinghouse for the citizens of New York and the wider public regarding the issues, the decision making process, and the redevelopment options being considered for downtown New York.

We envision the on-line forum as a virtual common ground of the 21st century much as Olmstead envisioned the 19th century urban park, which, for Olmstead, was a place where people from all walks of life would meet one another and form the basic understanding necessary for a progressive, urban based democracy to thrive in America. A problem that we all share today is that there is both too much and not enough information. On the one hand, citizens are inundated with “facts” and “data.” On the other hand, they don’t possess the tools and analytic frames of reference with which to evaluate and make sense of the information. We seek to create a web site that will mitigate this imbalance by providing

pertinent information as well as easily accessible analytic tools which will allow citizens to form their own judgments about the issues.

The *evolvenewyork.org* web site will feature research reports and FAQ's focusing on the various political, economic, environmental, health, and socio-cultural dimensions of the redevelopment process; a virtual walking tour of the WTC neighborhood; an "Open Studio," posting redevelopment proposals assembled by the many urban planning and design studios being conducted in academic institutions in New York and beyond; a calendar of public meetings and hearings addressing post 9/11 redevelopment; interactive maps as well as other interactive features that will enable citizens to engage the information providing feedback and input to policymakers.

It is especially interesting to create a website after having studied a web developing firm. In an important sense, we have moved from being observers to being *participant* observers, actively reflecting on a process in which we are very much participating. The "new economy" may have burst; but the real potential of the web is likely to be realized in the non-profit sector and it's exciting to be a part of that process.

Digital crossroads in Eastern Europe. My final field setting integrates my new research interests in interactive technologies with my earlier work on democratization and organizational transformation in postsocialist Eastern Europe by examining how non-governmental organizations (NGOs) use information and interactive technologies. Working with my long-time collaborator, Laszlo Bruszt (Central European University, Budapest) and Columbia graduate student Balazs Vedres, this study focuses on the intersection of two fundamental processes in the areas of international development. It addresses, on one side, the emergence of NGOs as new types of actors – new, not simply because they are making new kinds of representational claims outside of electoral politics but also because they exhibit new organizational topographies, frequently involving regional, transnational, even global networks. It addresses, on the other side, the emergence of the Internet and related information and interactive technologies – new, not simply because they provide a new medium of representation in a virtual public sphere but also because their adoption makes possible fundamental changes in the character of organization. As the postsocialist societies face the challenge of regional and global integration, NGOs serve as digital crossroads – boundary-spanning networks linked in transnational webs enabled by interactive technology.

The postsocialist societies of Eastern Europe provide an extraordinary laboratory for exploring the co-evolution of organizational forms and interactive technology: the emergence of voluntary associations in the region coincides with the digital revolution. Prior to 1989, there were almost no NGOs in the conventional sense in Eastern Europe, and the Internet was in its infancy. Before 1989, the small number of beleaguered voluntary associations communicated by *samizdat*, frequently circulating texts that were literally in manuscript, some even in the handwriting of elementary school children who had painstakingly copied a parent's writings so it could circulate more widely. Today, both NGOs and the Internet are experiencing exponential growth throughout the region. In the time span of little more than a decade, the technological framework in which voluntary associations are operating has gone from the limitations of a pre-Gutenberg setting to the opportunities of advanced communication technologies.

Supported by a major grant from the National Science Foundation, this research includes organizational surveys, website analysis, network analysis of hyperlinks, network analysis of patterns of organizational collaboration, and semi-structured interviews in approximately 50 NGOs in Hungary, Poland, Slovakia, and the Czech Republic, as well as in-depth ethnographic research in selected organizations.