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Context Matters: The Experience of Physical, Informational, and Cultural Distance in a Rural IT Firm

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We synthesize social informatics and regional studies literature to frame an examination of the role of information and communication technologies (ICT) uptake and use in the social experience of distance in a rural technology firm. Though distance is much talked about and regarded as a critical dimension in distributed work, the distinct ways that distance is experienced within a rural firm influence collaboration between the rural firm and its more urban customers and are little explored. This case-study town sheds light on how ICT use influences the experience of distance and collaboration in a remote location. In the first part of our results, we provide a descriptive account of the unique geographical, technical, and collaboration practice characteristics of the rural technology firm. In the second part of our results, we identify three experiences of distance: physical, cultural, and informational. We then synthesize our findings to reconstruct the role of distance and our understanding of the social experience of ICT uptake and use, in how workers experience distance. These findings have implications for regional studies scholars, and suggest that understanding how specific firms succeed will increase the effectiveness of public policy directed at regional development. They also provide for the further development of the social informatics approach, and contribute to a new perspective on distance to the literature on collaboration.

Keywords distance, distributed work, economic impact, ICT, regional studies, rural, social informatics

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Distance is framed in the social informatics and distributed work literature as a single construct focused solely on geographical factors. Our 3-year ethnographic case study of a rural outsourcing firm explicates a more nuanced understanding of the role distance plays in distributed work. Specifically, we identify the role that geographical distance plays in concert with notions of cultural and informational distance. Cultural distance reflects the inexperience of rural technology workers with organizational communication and coordination practices used in large, historically urban work environments. Informational distance is characterized as a gap in skills, experiences, and social relationships needed to discover and apply new knowledge within the firm. Each of these more specific components of the total experience of distance in the case study presented is identified abstractly in the regional studies literature, but these have not been previously framed as considerations in social informatics or distributed work research. The study of a rural technology firm brings a new perspective to our understanding of distributed work and the social impacts of technology in rural organizations.

SCALING SOCIAL INFORMATICS: AN INTRODUCTION TO THE CASE

Examining how ICT uptake and use in rural technology firms influence worker experiences makes two contributions to the social informatics literature. First, such firms are an interesting edge case for distributed work. Unlike most studies of distributed work, rural technology firms frequently lack a trained workforce, access to technology infrastructure, a vibrant professional community, access to local customers, and convenient air travel. For a rural technology firm, "distributed" means "isolated." In a rural environment, technology skills must be developed in the workforce, and client systems, not firm-owned collaboration systems, dominate work practice. Second, the

regional studies literature focuses on the potential economic impact of new high technology firms in a region, describes macro phenomena like industry-based resource agglomeration, and identifies key constraints, like the development of new, middle-level skills in a local workforce. A social informatics approach to the study of a rural technology firm at once provides a description of how widely recognized limitations on high-tech firm development in isolated regions can be overcome and also a large-scale context for social informatics research.

The unique context of our case study invites the use of this multitheoretical approach. Regional studies scholars focus on how geospatial, economic and community demographic factors influence the evolution of different types of regions. Social informatics research examines how computing and worker interaction reflexively influence each other in a variety of organization types. The combination of regional studies, with its macro focus, and social informatics, with its information and communication technologies (ICT) adoption frame, enables both areas of inquiry to advance their specific objectives in new ways. Specifically, ICTs enable individuals to reduce some constraints imposed by geographical distance, but we do not yet understand exactly how (Lee and Sawyer 2002). In fact, ICT use both overcomes and in some cases exacerbates the challenges of geographical distance (Olson and Olson 2000).

By synthesizing these two literatures, we aim to extend social informatics theories and enhance the ability of regional studies to guide policy makers towards projects with more direct, rapid, and measurable economic impact. Rural technology firms are closely connected to their communities and are thus shaped by the factors endemic to them. The appearance of such firms is often the result of local or regional business leaders actively searching for firms capable of bringing in more highly paid professional jobs. As a result, the social and organizational impacts of a rural technology firm extend beyond the boundaries of the firm and subsequently influence the surrounding community.

Engaging large-scale projects and theory building are two important next steps for social informatics research (Sawyer and Tapia 2007). One challenge for such efforts is finding study sites where the social experience of computing can be examined on a large scale. Rural technology firms represent one such opportunity for theory development and large-scale social informatics research. Such firms are also the focus of policymakers interested in investigating economic impact of increased Internet and ICT use (Henderson and Abraham 2004). Unlike widely studied urban firms, rural technology firms exist in a wider context where increased regional agglomeration of resources is necessary to enable growth and limited opportunities for knowledge spillover between firms constrain the local workforce. Few prior studies (e.g. Tapia 2004) examine social impacts of rural technology firms, and none that we found consider the impacts of such firms beyond organizational boundaries. Novel challenges like these, when examined closely, lead to theoretical insights (Eisenhardt 1989). Theories of organization and distributed work have not accounted for regional differences in organizational experiences of distance, particularly those that exist in rural environments. Theories of regional development do not consider how organizations in more rural regions work to address workforce gaps. For these reasons, we view this case through multiple theoretical lenses.

The rest of this article is structured as follows. We start with a review of related works. In the next section, we describe the field setting and research methods in depth, providing a high-level understanding of the study context and our approach. Following that, we present our descriptive findings, which help the reader understand the specific experience and nuances of the rural technology firm and its workers. In the second part of the results, we discuss the notions of geography, informational and cultural suggested by our data. That section aims to describe how different aspects of distance affect the ICT usage and adoption in the various parts of the firm and how these developments are influenced by degrees of isolation and business model. Finally, we discuss the implications of our work for the study of distance, the extensions of social informatics theory, and the role of social informatics in future regional studies research.

LITERATURE REVIEW

Here we critically examine related works in different literatures—regional studies, organization science, and social informatics.

Regional Studies and Organization Science

Gilligan (2005) critically examines rural adoption and use of ICTs by exploring what we mean when we say "rural," and how rural sociologists define "rural" as at least partly a social construction. "Rural" is a category of thought viewed as unwavering against the forces of change and time, while "urban" is a category of thought that marches forward and defines the next age. These categories influence people's perception of a region. Gilligan (2005) found that ICT uptake and use vary greatly not only across rural areas but also across specific technology. However, the perception of this uptake among the general public is uniformly lower for rural areas, even in cases where uptake is rapid. Gilligan frames her exploration using the European Union's five-stage continuum of rural, which moves from economic vitality to economic despair. In the United States, where the firm in our case study is located, a standard measure of rurality is metropolitan influence, which the U.S. Department of Agriculture (USDA) describes as a continuum of 1 to 12, with "12" having the least

urban influence, "1" representing a large metropolitan area (average 558 people/square mile), and "2" representing a small metropolitan area (average 132 people/square mile) (Parker 2004). Though there is much public imagery that conjures rural life, when we talk about rural, we are referring to the most rural classifications, 9–12, and provide further definition of our specific context in the following sections.

With few exceptions (Tapia 2004), prior studies of collaborative computing tool adoption take metropolitan infrastructures, social configurations, and lifestyles as a given. The organization science literature includes analysis of how ICTs are taken up in large, complex organizations (Mark and Poltrock 2004; Orlikowski and Barley 2001; Finholt and Sproull 1990), how this use reframes and restructures power and roles (Barley 1986; Eschenfelder, Heckman, and Sawyer 1998; Lamb, King, and Kling 2003; Nardi, Whittaker, and Schwarz 2002), and how work groups are constituted in technologically mediated ways (Brown and Duguid 1991; Muller and Gruen 2005; Keisler and Cummings 2002).

In contrast, regional studies literature often restricts its analysis to observations outside the boundaries of specific firms. Measurements are chiefly macroeconomic, and the internal characteristics and practices of different firms are unexamined. Technology appears in terms of the "digital economy" and the "analysis of ICT diffusion into isolated communities" (Hollifield and Donnermeyer 2003). For instance, Malecki and Moriset (2008) define the digital economy as the pervasive use of ICTs. Moriset argues that networked connections to metropolitan areas, combined with widespread availability of ICTs,make rural technology firms likely to succeed (2003). In later work, Moriset finds evidence that rural technology pioneers struggle (Malecki and Moriset 2008). He shows that in order to be successful, rural firms must overcome their distance from economic centers. Some concern exists about an urban–rural "digital divide," but this is a home access gap, not a business access gap (Horrigan 2009). Most significantly, participating in the digital economy requires rural technology firms to overcome the intrinsic penalty that arises from their isolation. Perception of scarce human capital is the most limiting factor (Malecki and Moriset 2008). The rural human resource gap perceived by local firms and regional economic development organizations includes genuine labor scarcity and perceived scarcity, depending on the region in question (Henderson and Abraham 2004).

Regional Studies: ICT Impact on Economic Development

Heeks (2008) sees two main foci in what he calls the "ICT4D 2.0" (ICT for development) world. According to Heeks, the focus has now moved up from readiness and availability of ICTs, which characterized ICT4D 1.0, to uptake and impact. In a subsequent work, Heeks (2010) addresses the question about whether or not ICTs actually do impact development, and identifies a scarcity of specific studies showing evidence that they do. In general, ICT use for development is shown to affect economic growth, but how individual firms and communities succeed remains scarcely understood. Heeks (2010) calls for ICT4D project managers to focus on design, governance, and sustainability. In the case of the individual firm we study, we address these issues in an organizational context. While much of Heeks's work centers on government-sponsored ICT4D projects, we focus on an initiative of an entrepreneur.

Research on ICT4D largely centers on developing countries, and not on economically challenged rural regions in the United States. Here, economic impact is different. In addition, there is a "developed," affluent, usually urban component that is absent from many developing countries. LaRose et al. (2011) examined the impact of government-sponsored efforts to bring broadband to such rural communities. They identified a statistically insignificant impact on local economies and quality of life that could be attributed to rural broadband initiatives. Their study focused on home adoption over a 3-year period, and showed that perceptions of impact were strongest in the community that incorporated a public awareness campaign. Similarly, Gaspar and Glaeser (1998) point out, the impact of new technologies like telephones takes decades to be noticed, and does not have the singular effect of altering a region's connection to "the outside."

Our study addresses these issues in two ways. One, the firm we studied was founded 4 years after a substantial rural broadband initiative was completed in the firm's main office, suggesting impact may be understood through more longitudinal and case-level research. Two, our study was conducted over a 3-year period.

Regional Studies: Agglomeration of Resources

The aspiration behind rural ICT initiatives is typically to spark development of new businesses in the local economy through an agglomeration of resources. Such efforts are inspired by experience of Silicon Valley and other high-tech areas where agglomeration leads to knowledge spillover between firms (Johnson et al. 2006; Malecki 2010; Pouder and St John 2006; Storper and Venables 2004).

Pouder (2006) focuses on differentiating two types of economic clusters that spawn development—tech-based and industry-based clusters. Tech-based clusters require a certain degree of knowledge spillover of the type

that occurs in places like Silicon Valley and Research Triangle Park in North Carolina. Industry-based clusters like tire manufacturing (Akron, OH), furniture making (Hickoryville, SC), and carpet manufacturing (Dalton, GA) show that it is possible to gather the necessary agglomeration of resources in less densely populated areas. Just as tires, furniture, and carpet firms were able to agglomerate in specific rural areas, possibilities now exist for industries that rely primarily on medium-skill, high-tech labor.

Regional Studies: Knowledge Spillovers

To facilitate such a new type of high-tech, commoditized cluster, knowledge spillover will, to some extent, need to occur across the distance between urban customers and rural technology firms. Peripheral regions suffer from barriers of lock-in and fragmentation that include a lack of supporting structures, low degrees of knowledge transfer, and educational emphasis on low to medium skills (Tödtling and Trippl 2005). Policy solutions to fill these gaps suggested by Tödtling and Trippl (2005) include catch-up learning, creating links to firms outside a region, nurturing innovative new companies, and focusing on building up medium-level skills. Such policy solutions may be effective if, within the innovative new companies, recognition of the reflexive relationship between tacit knowledge and physical distance (Gertler 2003) is accounted for through strategic utilization of ICTs.

Knowledge spillovers to rural regions from urban regions face significant challenges because of the importance of face-to-face interaction for building trust, screening members, and establishing an enthusiastic, high-energy work relationship between people (Storper and Venables 2004). Face-to-face interaction diminishes the likelihood of lying, helps to build shared values among a work team, and puts performance on display, which diminishes motivation for loafing and free riding. Proximity requirements do vary by the type of work; more codified, stable work processes hold distinct advantages as candidates for geographically distributed work (Storper and Venables 2004). Further, there is evidence from research on the impact of telephone uptake and use that collaboration across distance increases steadily in the three decades following initial widespread adoption (Gaspar and Glaser 1998).

This regional studies literature brings the community and economic context into focus. Themes of economic development, resource agglomeration, and knowledge spillover challenges all contribute to our understanding of the challenges any particular rural technology firm will face. Next we examine social informatics literature to consider ways of understanding what is happening within these firms, and drawing connections back into the communities where they are present.

Social Informatics: Virtual Organizations

Social informatics is the "interdisciplinary study of the design, uses and consequences of information technologies that takes into account their interaction with institutional and cultural contexts" (Kling 2000, 218). The fundamental premise of social informatics is that technology and context do not exist independently of each other (Kling 1979; Kling 1993; Orlikowski, Yates, Okamura, and Fujimoto 1995). ICT use in the context of a firm both shapes behavior and is influenced by behavior (Barley 1986). This shaping process is constantly evolving and the ICT must be treated as being embedded in the social structure of the organization (Avgerou 2001).

Communication is situated in a complex set of contextual relationships that have multiple dependencies (Pearce 1976). The role of technology communicating within an organization is much studied and has lead to a number of findings pertaining to performance and outcomes (Dewett and Jones 2001). In order to fully understand the manner in which individuals behave and utilize ICTs inside of an organization, one must fully understand the context and environment (Agre and Schuler 1997; Lamb and Sawyer 2005; Lamb et al. 2003). The context that influences behavior can be cultural, institutional, social, and physical (Lamb and Kling 2003).

Earlier research, before the development of the social informatics approach, did not take into account the influence that the social context had on the adoption and use of ICTs (Fulk and Boyd 1991; Fulk, Steinfield, Schmitz, and Power 1987). The understanding of the context is important for a number of reasons, including the following two offered as illustrative examples. The introduction of technologies into an environment that is not "technology ready" may lead to limited adoption that may ultimately degrade performance and waste resources (Olson and Olson 2000; Star and Ruhleder 1996); Olson and Olson 2000). On another level, technological introduction can also lead to a number economic, policy and social impacts that are often not predicted or assumed (Serenko, Ruhi, and Cocosila 2007).

In the case of ICTs in an organizational context, the introduction of a tool into an organization has unpredictable effects on the individuals who are required to utilize it. Zack and McKenney (1995) found that groups that utilize the same ICTs to perform similar tasks in different social contexts utilize the ICTs differently when required to perform similar tasks. These differences arise due to factors related to work role, interest, and previous experience (Kling 2000). Organizational policies are also a recognized factor in ICT uptake and use (Orlikowski and Gash 1994). Correspondingly, understanding the ecology of the organization can help to alleviate many of the problems that may arise with the introduction of ICT's to the workforce (Nardi and O'Day 2000).

Rural technology organizations face the challenges associated with ICT adoption, broadly construed, in addition to challenges that are specific to their rurality. For example, the introduction of ICT into a workplace is often premised on the expectation that it will lead to rapid organizational change. Many studies show this not to be the case (Burkhardt 1994; Markus and Benjamin 1997; Sawyer, Crowston, Wigand, and Allbritton 2003). Instead of swift institutional change, the introduction of ICTs often becomes entangled in institutional politics (Danzinger, Dutton, Kling, and Kraemer 1982). After implementation, ICTs can become institutionalized, limiting the ability of a firm to make changes in the organizational and task structure even when such change is in the best interest of the firm (Kling and Iacono 1988). This rigidity may lead to difficulties in performance of tasks that are not technologically supported through the firm's infrastructure and that often prompt employees to use personal technologies to get around bottlenecks within the firm (Kling, Rosenbaum, and Sawyer 2005).

Noninstitutionalized solutions introduced by employees can lead to a lack of coherent ICT structure and the emergence of factions of employees within the same organization who utilize different ICT and become isolated as a result. In the rural context, studies have shown that personal ICT adoption is a result of organizational ICT adoption, especially among those with less formal education (Hollifield and Donnermeyer 2003). Rural firms are an interesting case in which to examine these types of scenarios, because the outside influences of technology are more limited than those in an urban area, where people in a workgroup have very diverse experiences with technologies and a rich array of personal, favorite tools for overcoming the limitations of institutionalized tools. Rural workers, at minimum, have reduced access to the electronics retailers where such devices are sold.

More broadly, we build on the following four major social informatics findings (Lamb and Sawyer 2005; Sawyer and Eschenfelder 2002):

1. ICT utilization leads to multiple and sometimes paradoxical effects.
2. ICTs shape thought and action in ways that benefit some groups more than others and these differential effects often have moral and ethical consequences.
3. Design, implementation, use, and context of ICTs have reciprocal relationships within the organization regarding ICT usage.
4. Effects of ICT utilization vary depending on the level and perspective of analysis.

CONTEXT AND METHODS

In this article we examine a rural technology firm in the United States—Small-Town-Co (STC). It began operations in 2004, and is in a small Midwestern town with an approximate population of 4,000 people, located more than 200 miles from the nearest city with more than 100,000 people. Management and organizational structure at STC was centered on the single entrepreneur who started the company—Alan. In addition to Alan, STC had two individuals responsible for administrative tasks and another set of individuals who coordinated the fulfillment of customer needs. During the course of the study, 2006–2009, the total employee count at STC grew from 8 to 53.

STC was conceived from the beginning as a company that would move technology jobs from large metropolitan areas to rural communities. It focuses on IT outsourcing, including market analytics, Web development, infrastructure maintenance, and testing services for safety critical aeronautical software. In contrast to offshore outsourcing companies that offer lower cost structures for software and technology maintenance, STC offers a range of higher end services that include creative work, software engineering, and analytics work that bridges data analysis with culturally contextualized business analysis. The firm generates at least 70% of its revenue from outside its immediate area, indicating significant ongoing connection with metropolitan areas (Beyers and Lindahl 1996).

STC has three offices—Small-Town-Co Headquarters (STC HQ), Small-Town-Co Satellite 1 (STC S1), and Small-Town-Co Satellite 2 (STS S2). Table 1 summarizes the size and rurality of each location using the USDA's 12-point scale.

One of the defining characters of STS is its practice of "organic workforce development." In response to perceived and actual deficits in the available pool of skilled workers in a rural area, STC invests in development of software development and data analysis skills in the people who live in the town and surrounding region. Employees at STC HQ were trained in Microsoft.NET technology. The experience of going through a bootcamp-style class together created an internal network of peers within STC. The employees at the two satellite offices were trained in different technologies, but the bootcamp-style 12-week training experience and resulting network is a common feature of the STC experience.

TABLE 1
Location and size of STC offices (December 2008 Census)

	Rurality	People
Small-Town-Co HQ	9	35
Small-Town-Co Satellite 1	5	7
Small-Town-Co Satellite 2	2	9

METHODS

The principle data collection method was ethnography, carried out through participant observation over 3 years from 2006 to 2009, including 8 months of daily immersion in the firm by the paper's first author. We conducted 71 semistructured interviews (totally more than 50 hours) with 24 individuals to develop a rich understanding of how the organization worked and how members made sense of the sociotechnically constructed relationships with distant partners, customers, and locations. We also observed meetings, and maintained field notes. For data analysis, we followed LeCompte and Schensul's (1999) guidance for the interpretation of our ethnographic data. As Barley (1986) notes, organizational ethnography, especially when it is carried out over a period of time and thereby has a significant longitudinal dimension, can generate richly textured data on organizational members' daily working practices, which yield insights into the organizational culture (Barley 1986).

Our "in-the-field analysis" integrated a constant awareness of the "hermeneutical process" principle. The hermeneutical process foregrounds a constant consideration of the interdependent meaning developed through interaction with and interpretation of the environment. This process is central to our analysis and the experience of STC. Out of the field, data were analyzed first from the bottom up using a grounded theory approach. The manifestations of distance that are identified later in the paper emerged from this coding. The data were then analyzed from the top down using a coding scheme for organizational traits, identified initially during our bottom up coding. Constant comparative analysis was used to surface the sociotechnical characteristics and how these were manifested in the three forms of distance.

Interpreting and contrasting this case study from a sociotechnical practice perspective involved drawing on three methodological approaches. First, through daily participation as a member of each organization over an extended period of time, in the ethnographic research tradition, we grounded our understanding of what each organizational member did at work. Second, through observations at a range of sites and events, including participation in meetings at customer sites, we developed a good understanding of STS's relationships with local organizations and customers and also intraorganizational relationships between distant offices. Third, through regular analysis of our data in the field we ensured that changes in sociotechnical practices over time were recorded and analyzed.

CONTEXTUALIZING THE FIRM

Our grounded theoretical coding and analysis of the field data led to the identification of the three factors that shape the character of a rural technology firm: geographical, sociotechnical, and collaborative practices. Each of these factors has a major bearing (in both positive and negative ways) on the operation of the firm and the behavior of its employees.

Geographical Characteristics

Our analysis revealed three subsidiary (or "axial") dimensions of geography as important to the internal functioning of STC: Physical Workspace, Worker Mobility, and the Virtual Network.

Physical Workspace. STC benefited from low-cost office space, compared to costs for firms in large metropolitan areas. STC's startup operation required no dedicated space initially, and within 6 months the firm was working out of commercial office space. Alan noted that the low fixed costs of this space greatly reduced the risk and his perceptions of it, compared to what weighs on the minds of his counterparts in metropolitan areas. In effect, lower costs were a positive payoff of location in a remote area.

Worker Mobility. In an urban area, no-compete agreements are instituted to constrain movement of an employee to a competitor. The parameters and concerns are quite different in rural areas, as workers in rural areas do not often have the choice of going to work for a competing firm because usually none exist nearby. That relative isolation is reflected in STC's no-compete agreements, which restrict employment within a 100-mile radius of its offices. In rural areas, the principle concern of proprietors is that workers will create new, competing firms in the region. Here, while limits on worker mobility protect an individual proprietor, they may work against the interests of the region as a whole because of they impede the emergence of industry clusters.

The Virtual Network. The enhanced reliance on virtual networks for day-to-day activities shapes a rural technology firm's operations in two ways that are significantly different than urban firms. First, network outages that breakdown connections with geographically dispersed customers are more likely to occur in rural areas, which lack the redundant telecommunications infrastructure common in more urban regions. Furthermore, the time it takes to get the connections back up takes much longer, as the equipment and personpower needed to repair the network are usually much further away from the point of network failure than in urban areas. Second, important relationships with customers and between employees in different offices are more sociotechnical than those of urban firms. Teams work together almost exclusively through ICT, and these relationships are shaped and help

shape ICT usage. In effect, connection to the Internet is a more foundational component of rural technology firm infrastructure than urban firm infrastructure. We are not suggesting such connectivity is not a risk for urban firms, but that impact of failure is greater in our rural technology firm's context.

Sociotechnical Characteristics

STC developed its external relationships in a way that reflected the intersection of the firm's isolation, business model, and available ICTs. We describe these distinctions as "sociotechnical characteristics." First, we examine and discuss the primary, common internal sociotechnical characteristics. Second, we discuss how customer needs drive differences in STC's external interfaces in each location.

Common Internal Technical Characteristics. The free and yet highly functional Internet platforms are relied on as central IT infrastructure by firms like STC, which do not have large IT budgets. For synchronous communication, STC used a combination of Skype and Microsoft Instant Messenger. The former was used for planned interoffice communication in place of phone calls, and the latter for task-oriented, informal communications between employees. During project initiation, Basecamp was used to develop task lists and assignments. Once a project was launched, STC used a FogBugz to manage requests, assign work, and communicate with STS technology personnel and also customers. In keeping with previous studies on ICT adoption in organizations discussed in the literature review section, different individuals within the firm adopted these common technologies in different ways.

External Customer Differences Drive Firm Characteristics. STC's relationships with its customers greatly shaped its adoption of information technologies, especially groupware. Five major customers were responsible for more than 70% of STC's gross revenue. Each of the major customers had a different set of collaboration tools required for work within their sites. Consequently, STC's employees routinely adapted to different sociotechnical infrastructures, depending on which customer they were interacting with. The diversity in sociotechnical organization, directed by customer configurations, also influenced how workers interacted within STC.

Collaboration Practice Organizational Characteristics

As a consequence of varied interfaces with customer, collaboration practices were not consistent across the firm. STC work groups emerged around the two key practice domains of sales and customer projects, both of which operate around a stable core of STC management personnel. Each functional group experienced distributed collaboration differently. In this section, we discuss the collaboration practices for the sales and customer project teams. Through these descriptions, customer security policies, time accountability, and interruption practices emerge as central themes.

Sales Process Groups at Small-Town-Co. STC services are sold across a wide array of industries and geographic locations. STC's customers expect face-to-face visits, which in turn requires an average of 2 to 3 days of sales travel each week for Alan, the owner. For example, practices for assessing information quality in the prospecting cycle, selecting new cities to target, and managing the process of moving a sales lead to "close" (execution of a sale) are all highly variable.

Three factors contribute to this performance variability. First, heavy travel to meet customers and potential customers limited the amount of time available for planning. Driving and chartered flying both required early-morning departures and late-evening returns. Second, like many technology firms, STC's internal IT was not well developed (Tapia and Ortiz 2008; Tapia 2004). Third, operations management and senior technologists were often pulled into the sales process with limited preparation. This third point has repercussions in the broader organization. Operations staff members (people on teams doing customer work) were frequently interrupted by the sales process, which interfered with performance on customer contracts and created a tension between customer requirements for time logging and internal billing—40 hours per week—and nonbillable, unplanned sales work. Collaboration around sales was, consequently, a process that involved ad hoc collaboration among potentially all firm members; employees described this process as boundless and uncontrollable.

Customer Project Teams at Small-Town-Co. STC executes three main types of projects: software maintenance, software testing, and data analysis services. The transition between sales and operations follows a discernable pattern. First, the operations team sets up connections and security configurations for STC employee access to the new client's ICTs. STC does not dictate communication and information sharing technologies; each team adapts to its customer.

Next, all STC employee time accounting is processed through a customer's system. Core collaboration tools like instant messenger, e-mail, and Web conferencing are also within each client's infrastructure, though the specific toolset varies by client. STC infrastructure for these collaborative ICTs is marginalized. The consequence for

STC employees is that their identity shifts quickly to that of the customer; their connection to STC diminishes.

Reliance on client ICTs for coordination makes it difficult for STC teams working with different clients to coordinate with each other, and makes each team's overall STC experience distinct. This is an inversion of the usual consultant experience, where a nomad loses touch with the employer because the nomad is never there. In this case, people sitting side by side in the same room lose touch with their employer because they are connecting to an outside world through an ICT. In our description of the data, in the following, this is described as employees "going native."

STC workers sitting side by side but working on different customer teams are less connected than an STC employee and his or her customer counterpart who IM from hundreds of miles away. An argument could be made that "going native" is the result of suboptimal management practices, but Tapia (2004) and others have previously observed that such developments are an understandable product of the chaotic and intense environment that exists in a small firm. An STC employee with management responsibilities noted:

> Today I have enough work [for the client] that this is all I can do. Alan wanted me to help him with some stuff that he needed done and I just, I don't have time. Stuff that I should be doing as a [manager], I can't. And then as far as mentoring, a lot of stuff has to fall off because I just don't have time and I walk into another world [when doing client work].

Another STC employee noted, "it's actually interesting, all the [STC] stuff on my desktop kind of goes away when I'm in the [client] world."

Geographical, technical, and coordination practices at STC have some novel characteristics compared with less rural enterprises. These characteristics influence the experience of distance within the firm. In the next section we examine the different experiences of distance for employees at STC.

THREE TYPES OF DISTANCE

Distance is often conceptualized as a solely geographic factor in the collaborative work literature. Our findings suggest that distance as a construct requires a more nuanced construction. Beyond geographical distance, we see two additional forms of distance—cultural and informational.

While geographic distance does shape the environment for people working in a rural area and cultural and information distance are influenced by it, our findings suggest that technological configuration, more than geography, shapes the information and cultural realities of the STC employees who interact with remote partners.

Geographical Distance

As noted earlier, client activities were usually conducted using the client's own corporately prescribed ICTs. This made STC's own ICTs less central to daily activities in the firm. This marginalization of shared ICT infrastructure within STC influenced the experience of geographical distance in the firm.

Communicating with the Client—"Going Native." As a result of the dependence on client prescribed ICTs, employees became integrated into the world of the client more than that of STC. Consequently, their identity shifted to that of the client and their connection to STC diminished. In other words, STC employees "went native" and joined their client's world. This created identity and coordination issues within STC, as individuals working for different clients had less connection to each other than their counterparts at the client site in a large city many miles away, with whom they worked over ICTs. This also rearranged the institutional organization and context at STC by placing the employee inside the virtual walls of the client.

After an initial kickoff meeting with the client team, one STC employee reported that they "talked quite a bit and had gotten to know each other" through the client ICT, in this case instant messenger (IM) and e-mail. Another employee's experience illustrates the concept of "going native" further:

> All the stuff on my desktop, including messenger, kind of goes away when I'm in the client world. And it turns off all my messenger sounds so I don't even hear when people are trying to communicate with me, other than the client.

STC employees get isolated from the local STC world when they login to a client-provided ICT. Conventional collaborative research shows that people experience greater ease in informal communication with those sitting next to them. In the case of STC, we see the opposite. In effect, the STC employee "has been assimilated" into their client environment through sociotechnical means.

Communication—Internal. Employees coordinated synchronously and asynchronously. When knowledge sharing or coordination was immediate, members of STC IM'd with each other. Employees also reported that they used the firm's instant messaging service to exchange files and images related to work. An employee in a satellite office described using IM as a file-sharing mechanism: "we use Messenger a lot for simple file sharing. If I need to send them an image or something like that, or I send them their videos that are done through Messenger." In some instances, employees utilized the instant messaging client as an ad hoc desktop-sharing device by taking screenshots of their desktops and sending the screenshots

to employees in other offices in order to illustrate an issue that had been encountered. One employee noted, "If I can't describe what something looks like, well, I can take a screenshot, then send it over and they can see it." This use of the instant messaging service as a desktop sharing substitute highlights how freely available ICTs put easy-to-use, powerful collaboration tools in the hands of small firms.

Another reason they used instant messaging was that "talking through the rooms gets too loud and distracting." In an effort to keep noise down, individuals utilized instant messaging, though many described a preference for in-person discussion. If the individuals with whom they needed to collaborate were located at a different office the employees would resort to a combination of IM and e-mail, depending on the complexity of the problem and the need to document it for future reference.

STC employees were required to use Basecamp, which supports coordination of project work, to track their hours spent on each part of a project, and to track milestones of their project. Even though employees were encouraged to use the tool to track their tasks and to log their hours, few of them used it for anything other than tracking their hours. An employee at the main office remarked, "I mean, we mostly just get on there to enter our time. We don't use it for anything outside of that." Even though employees reported using it only to input their hours, the office administrator noted that many forgot to do so according to schedule and mistakes were common. This led the office administrator to spend a lot of time tracking employees down to enter their time correctly.

Another factor affecting the limited adoption of Basecamp was the fact that it was an internal tool, used by STC management. Because employees experience "going native," there is no penalty for not using internal tools, while success with the client is paramount. This is illustrated in the following quote, where an employee expresses a preference for simply collaborating with his STC supervisor to coordinate client work, instead of using STC tools that would make this coordination work more widely visible within the firm:

> I sit next to Toby, which is my direct supervisor [working for the same client], so if I'm gonna follow my direct chain of command there, the first person to talk to is Toby. And if I'm gonna put it in Basecamp first, I've taken up more time away from my production to put it into Basecamp to find out the same thing that I would if I would've just said, 'Hey, Bill.'

This institutional difficulty with entering hours on a daily basis may have been a result of the backgrounds of the employees and illustrates a similar institutional constraint found in other research on introduction of new tools to the workplace (Pino and Mora 1998).

Cultural Distance

Prior to training, STC employees were not digitally naive; many played World of Warcraft or used Facebook. But there is a difference between social and professional uses of ICTs. STC employees lack experience with professional use of ICTs. Cultural distance emerges from this gap. We see three dimensions to cultural distance: (1) personal Internet use, (2) limited local Internet resources, and (3) changes in ICT use resulting from work at STC.

Personal Internet Usage. Though many of the employees did not have an in-depth understanding of ICTs, all but two of the 24 interviewees had some form of Internet access outside of the workplace. Those employees who had Internet access reported a range of activities and length of time spent online spanning from once a week to as much as 5 hours a day outside of the workplace. Employees with limited personal Internet use tended only to check e-mail and one or two news sites when they logged in at home. These individuals expressed little interest in finding new information sources. The employees who used the Internet on a more frequent basis outside of the workplace noted a more varied usage pattern, including playing online games such as World of Warcraft ($n = 5$) and the usage of social networking sites ($n = 8$).

There was a distinct difference between the group of individuals who played online games and those who maintained a presence on a social networking site. Only one individual claimed to be active in both online games and social networking sites. The individuals who played online games reported playing multiple days a week for multiple hours, noting it was a significant hobby. Some of the individuals who played online games did so with others at the company. These individuals were unaware of the presence of the other local gamers before their employment at STC and were therefore brought together on the Internet through their physical employment.

Employees were encouraged to use social networking to network and communicate with other individuals at the company. The employees' usage patterns of social networking sites varied. Some employees reported checking their social networking site (SNS) account once every few weeks, while others checked them several times per day. Those that did not participate in SNSs before their employment at STC reported using the social networking sites more as they had more exposure to other individuals using social networking sites. One informant noted a tension between work and personal use of Facebook: "I don't know, I guess Facebook probably, but then that kind of is that work or is that privacy? You know what I mean? The friends that I graduated with and haven't seen in years, we talk through Facebook or some I might text them, but besides that, I don't see them or talk to them either."

STC uses Facebook to support distributed work in two ways. First, in an effort to put "faces to names" when handling paperwork from individuals in other offices, the office administrators used Facebook. Second, Facebook is used to monitor the work status and well-being of remote employees in some cases. One employee remarked of another, for example, "I've seen her Facebook status updates and stuff so I can see she's definitely going through some hell down there." The content of the status updates subsequently led him to offer the other employee help on parts of a project.

Local Internet Usage. STC employees did not make extensive use of local websites or information resources. Those who did use local websites used them for tactical purposes that could be categorized as "active seeking" (McKechnie, Goodall, Lajoie-Paquette, and Julien 2005). One individual used the local middle-school website to actively "monitor a schedule of events," and another individual used a local website to find a phone number for a local business instead of using the paper phonebook. In one case, employees in STC-1 were not interested in using the local community newspaper website because the discussion forum had become dominated by laid off employees of STC who were posting negative statements about the company. This type of activity is unique to the rural context we study.

STC employees remarked on the scarcity of relevant local websites. One employee noted that during a recent apartment search he was unable to find any information on any website including larger apartment search websites. This situation is unique to rural geographies, as most developed areas have information resources for finding apartments, including online classified sites such as Craigslist. Individuals in urban areas tend to depend on these sites for more, while the information for those in rural areas does not have a critical mass on these types of websites (Dewett and Jones 2001).

Change in ICT Use. Prior to employment at STC, many of the individuals did not use ICTs for work. The 12-week bootcamp study training program for new employees, which included computer programming, changed that quickly and was the first exposure many had to computer use in the workplace. One individual noted, "I didn't see the need to get one [computer], and then when I started the class, I got a laptop." A significant number of individuals interviewed noted an increase in their interest in technology in general after 12-week bootcamp and working at STC for only a short time.

Two cases of personal ICT use among the employees at STC are illustrative of the change. In one case, an individual went from not knowing how to use a computer to being able to troubleshoot computer problems for all of his family and teach his younger brother how to use his computer. His parents began introducing him as "our son who works with computers." In another case, an employee noted that he went from having one computer to four as a result of his increased interest in technology. He also set up a dedicated computer in the family room to access online television content. He noted that his increased technology interest influenced his wife to get more involved in technology and they now use "CD's and DVD's to exchange media with family members."

Working at STC made employees more comfortable and competent at using ICTs to find work-related information. In the most basic example, employees expressed enthusiasm about learning how to be more effective with Google. One employee commented, "Frequently, Google at a lot of times ends up knowing what I want more than I do so I'll search for a broad subject or even something similar to what I actually need and through following the links, going through several article chains, I'll eventually end at what I am needing to find."

One employee noted that after working at STC for a short time his ICT use changed the way he went about doing things: "I know how to use a computer now. I know where to go. I know the spots. It's a whole new world for me now after working up here." In addition to the benefits realized by having others assist them with the tools, employees noted that the experience using the tools for work-related problems helped them develop problem-solving skills in the world beyond STC.

Informational Distance

STC is dedicated to "rural outsourcing" and the recruitment of individuals from the rural community to ICT focused jobs. Many individuals employed by STC did not have education beyond high school and therefore lacked writing and analysis skills that would be traditionally learned as part of a college education. This created a set of unusual management roles at STC. For example, managers reported reviewing formal client communication for spelling and grammar 6–10 times a day.

Mechanisms for Learning. Lack of college also meant an absence of the sort of social and professional networks built through a college experience. Therefore, their professional peer group consisted solely of individuals they encountered at STC. Limited education and networks were major impediments for STC employees, as they lacked both information skills and social networks for accessing information.

Often industry magazines and software and technology reference books were used as the first step in problem solving for a programming question. If these books and magazines did not help them find an answer, new

employees then turned to the Internet. These searches were often not fruitful because of the unstructured nature of Internet resources, and the limited capabilities of new employees to "ask Google a question" that would lead to a useful answer. STC employees tended to be more familiar with the use of indexed, printed resources, and when these proved insufficient for questions about new technology, they were stuck.

In addition to Google, employees referenced public [software] code sharing websites. In some instances, individuals would find a forum that focused on the software development tool in question and would post their specific question to the forum for assistance. Many individuals claimed that these types of independent sites provided more specific answers to questions than tutorials or information on vendor websites because other users provided a level of detail that aided STC employees more than vendor sites that often assumed core knowledge.

Regular feedback from experienced employees on the same client team and from clients themselves also helped new STC employees build an understanding of how to solve problems when the answer was not readily apparent within the organization. In addition to publicly available resources, employees on one project received weekly code reviews from the client to help guide them and provide feedback on work progress. This guidance was not available or sought after within STC, beyond an employee's client team.

Because of these shortcomings, STC employees were actively mentored in basic problem-solving and information-seeking strategies during their first weeks on the job following bootcamp.

Information-Sharing Behavior. Additionally, STC employees faced obstacles in the course of sharing information with each other. One of the greatest difficulties they noted was the lack of a unified database to store and share acquired information. Many of them said that they would have taken the time to share the knowledge that they had acquired with others if they had a place to put it.

When faced with a series of difficult development issues one employee took the time to find the solution and document it for other employees. But the lack of infrastructure for sharing the document with others limited the payoff of the effort. This employee noted that this inability to share resulted in duplicated effort for others who encountered a similar issue in the future. In another instance, Alan remarked that he had "so much valuable information that has accrued over the years," but he had nowhere to house it for others to reference it. Many other individuals reported that they often found solutions to their problems, but did not document it because of the lack of a repository for the information. In another case, an employee observed that problems worked out over ICTs usually get lost if not documented elsewhere. One employee remarked, "We don't really have any archiving system. We could figure something out that's really awesome and don't use it for three weeks, and then we're faced with the same problem, and our answer has already disappeared into the ether."

On some occasions, individuals reported finding information to solve a problem and then subsequently sharing it with their immediate colleagues over email or through an instant message. When asked how they decided who they shared information with, the most common response was the individuals in their immediate physical location who were assigned to the same client or individuals they had worked with on similar issues. The mechanisms for sharing information depended on the individual who found the information identifying other individuals who might need the information. In general, information is not shared among STC employees in a planned and coordinated way. Knowledge management at STC is, for the most part, more serendipitous than an activity of management. STC clients, in contrast, do have systems in place for sharing information and much STC client-specific information is captured in systems the client controls. This puts STC in much the same position as offshore outsourcers: partially not in control of the intellectual property and business processes they develop.

DISCUSSION

Kling and Scacchi (1982) demonstrated how the social impacts of computing are interwoven with local constraints and evolve through fitting and packaging of systems. They argued that by viewing the impacts of computing as socially and technically interrelated, the complexity of such systems could be better understood. Regional studies literature, in contrast, views success in broad, economic terms. The case of STC enables social informatics researchers to explain how firms in isolated regions successfully apply ICTs on a local basis to connect those regions to larger economies. The social impacts implied by economic measures can be described and should be further elaborated in future studies. How economic measures are constituted should subsequently be informed by our improved understanding of the social impacts of rural technology firms. This is a challenge to the status quo in regional studies, and a source for renewed vigor in social informatics.

The relationship between ICT investment and economic development in rural regions has been researched extensively, but the keys to successful execution at the level of a rural firm have received little attention. The regional studies literature and literature on ICT4D describe the potential and real economic effects of new technology firms in isolated regions. The organizational science and social informatics literature describe the mutually constitutive nature of organization, social experience, and ICT uptake

and use. Descriptions of how technology is taken up and used in developing regions are scarce. For regional studies scholars, our case study provides a concrete connection between research related to regional economic development, the recognized model of industry clusters to support sustained economic development in a region, and the challenges of limited knowledge spillover in isolated regions. Moving from consideration of macro-level economic impacts toward theories of how economic barriers are overcome in specific firms facing various economic barriers will enable regional studies scholars to have impact at the firm level.

From a social informatics theory perspective, the broader contextualization of the case embodies a more nuanced construction of distance. This creates space for theory to consider how the social impacts of technology within a firm are connected to the social impacts of a firm within its local economy and community. STC is an edge case that illustrates how a different type of workforce influences uptake and use of ICTs in an isolated firm and how the interaction of employees using a concerto of firm and customer ICTs sociotechnically constructs the organization of STC itself.

Our analysis points to four challenges for researchers in regional studies and social informatics: (1) the nuanced construction of distance, (2) the commoditization of ICT labor as a new mechanism for regional economic development, (3) the social construction of technology in a medium skilled, isolated workforce, and (4) the need for research in regional studies and ICT4D that adopts the social informatics orientation.

A More Nuanced Construction of Distance

Connecting rural technology firms to their more urban customers requires overcoming many manifestations of distance. We identify three dimensions of distance: geographical, cultural, and informational. In the case of geographical distance, members of STC are paradoxically more isolated from the people sitting next to them who use a different customer's ICTs than they are from those customers. Geographic distance is a fundamental reality of STC's choice of location. How STC successfully bridges that distance requires us to consider the two other dimensions of distance.

First, STC overcomes one of the critical, recognized gaps in rural economic development—the human resource gap—by training the workforce that is already in a rural area. STC employees, who generally had not completed college, were put through a 12-week bootcamp. There is a cultural distance between this type of workforce and customers, but this distance was deliberately bridged through careful facilitation of customer interactions during an employee's first days. Over time, the cultural distance closes, and systematic knowledge spillovers occur between STC and their customers. As cultural distance narrows, the employee's actions in relation to ICT use and professional practice become more similar to those of their clients. In a firm like STC, where the number and variety of clients varies, this can lead to numerous cliques of employees. These cliques increase the distance between individuals within the same firm who worked with different clients and reduced the distance between the employee and the client.

Second, the notion of information distance draws our attention to how an isolated technology firm is able to create sustained knowledge spillovers through targeted use of Internet resources. As employees become more sophisticated in their problem identification and question formulation skills using Google, the barrier of geographical distance as a limit on knowledge spillovers is diminished. We are not suggesting that rural technology firms could emerge as distant participants in dynamic technology clusters like Silicon Valley or Boston, but that the geographical distance of STC from its customers does not constitute as irreconcilable a barrier to development because information distance can be diminished.

Commoditization of ICT Labor as a Mechanism for Regional Development

As Tödtling and Trippl (2005) suggest, isolated regions have potential for the development of medium-skilled workforces. STC is an explicit case of how a firm organically builds its own medium-skilled workforce in an isolated region. The contrast of high-technology agglomerations and industry agglomerations of firms identified in previous regional studies research (Pouder and St John 2006) puts a limiting frame around questions of regional economic development that traditionally include natural resources, niche manufacturing, and lifestyle migrants (Beyers and Nelson 2000). STC is one example of a new mechanism for regional development: training rural workers in the medium-level skills required to perform data analysis, Web development, software testing, and other ICT-related work. Jobs like those at STC pay much better and have a broader impact on the community than call-center positions, for example.

The commoditization of open-source tools for managing technology work is also a factor enabling STC's success. Free, powerful tools previously only available to larger firms enable small, geographically isolated firms like STC to aspire to be like the sort of entrepreneurial, technological firm found mostly in urban areas. The decision to develop their own workforce through a customized, bootcamp-style training program is also innovative. In place of a broad, public effort to increase ICT skills, STC connects training directly to work, and recognizes learning

as an ongoing component of work. The training program does not end at the completion of the bootcamp, but continues through interaction with local and distant colleagues, the use of the Internet, and relevant work experience.

Social Construction of Technology in a Medium-Skilled, Isolated Workforce

Work is accomplished in small, customer-focused groups at STC. Small groups have three primary motivations: accomplish work, satisfy the needs of members, and sustain the group itself (McGrath, Arrow, and Berdahl 2000). Social identity theory explains how members of different social groups begin to self identify with those groups and how those self-identifications become reinforcing (Turner, Brown, and Tajfel 1979). In the case of STC, group membership centers on a technologically mediated relationship with the client. Belonging to a group is manifested through the specific technologies that group members are assigned to use, and the client for whom they are used. Social identity is, in the case of the STC workers, immediately visible based on the tool they are logged into, and who is in their client-sponsored instant messaging tool window. In the accomplishment of work, group identity is persistently reinforced. At STC, the relationships embodied by tools are as significant as the relationships with those who are physically adjacent. STC workers assigned to a client sit together in small groups at STC. In this context, prior research on the role of physical proximity in communication (Birnholtz, Gutwin, and Hawkey 2007) gets a new wrinkle, with client culture that is distant being reinforced at the local, workgroup level at STC.

While accomplishment of work and maintenance of the group are accomplished through ICTs, the third leg of group purpose—satisfaction of member needs—is visibly influenced by factors outside of STC or the client relationship. STC jobs are good, high-tech jobs in an otherwise economically disadvantaged region. There is social status afforded to STC workers within their families, as noted with employees who are now regarded as "computer experts" outside of STC. In this way, being identified as a worker at STC in the community is a source of status. How this influences worker motivation to take on different types of less appealing assignments in a rural environment therefore warrants future study.

A Social Informatics Perspective on Regional Studies

Here we describe the nuanced and uneven process of building a technology services firm in a region without a technology workforce already in place. There is an ecology that develops within the firm that interacts in unexpected ways with customer culture, firm development, and the experience of employees working over distances. The experience of distance at STC is complex, influenced by geography, culture, and informational dimensions of distance. In many respects, regional studies literature focuses on macro-level "impacts" of ICT uptake and use on locales. Our study demonstrates that a social informatics perspective builds understanding of how the economic development measures in regional science research are influenced by a specific firm's construction of explicit knowledge spillovers from customers into the firm.

IMPLICATIONS FOR SOCIAL INFORMATICS RESEARCH

Social informatics research seeks to understand the social impacts of computing and how the environment shapes adoption and utilization of ICTs. But much of the published research in the field focuses predominantly on the organizational impacts of computing. With the spread of computing across the social fabric, social informatics research needs to expand its scope beyond the boundaries of particular organizations. Rural technology firms like STC, therefore, are especially compelling research sites, as they show how knowledge spillovers can occur between the firm and the region when the former builds bridges from a rural community into urban economic centers.

The social impact of STC on its surrounding community is a provocation for theory development for social informatics researchers, just as government agencies and emerging technology firms helped Kling and others create the foundation of the field. If organizations are understood not merely as islands unto themselves, but as institutions that are mutually constitutive with their surrounding communities, then the measures of economic impact employed by regional science scholars need to be correspondingly made more comprehensive.

With STC, we see that a major social impact of its operations was the development of the local workforce. Employees develop new technology and ICT skills and they become creative problem solvers in a way that would not be possible with manual labor. Further, the cultural adaptation of rural workers at STC to their urban customers leads to greater understanding of white-collar business culture in a rural region. Regional studies scholars speculate about such effects; this study of STC, informed by the social informatics approach, explains how those effects come into being.

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