Resilience and the Rapid Shift to Remote Working at a University: Emerging Questions

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Abstract

We describe work-in-progress for a qualitative, interview-based study of organizational resilience at a large research university during the unfolding crisis of the COVID-19 pandemic. This paper discusses example data and questions raised by interviews of participants that represent a wide variety of roles, contexts, and challenges. Our ongoing data collection shows participants navigating different ways of enacting resilience in their attempts to weather the rapid changes to their work and organizations brought on by COVID-19. This preliminary work already raises questions about how organizational resilience is enacted, how the boundaries of formal organizations are being redefined, and work activities are being reorganized. These themes lay groundwork for future studies of organizational and system resilience during long-term crises.

Keywords
Resilience, CSCW, organizational theory, infrastructure studies, coordination

Introduction

The scale, scope, and intensity of the rapid emergence and spread of SARS-CoV-2 disease (COVID-19) is unprecedented in recent times. There continue to be troubling disparities around who has the resources and support to work remotely. At the same time, the number of people expected or required to work from home is similarly unprecedented and is supported by the increased ubiquity and variety of tools and technologies that enable remote working.

Our study investigates how a university, as a large, complex organization, located in Seattle, Washington is transitioning and adapting to remote work in order to slow virus transmission. Seattle was the first region to document community spread of COVID-19 in the United States. This research sheds light on the ways that actors adapt their practices to enact organizational resilience. The goal of our work is to support the coordination of social distancing and remote collaborative work. Our perspective is somewhat distinctive: rather than centering collaborative technologies or individual behaviors, we focus on technical and human infrastructures with the goal of exploring how individuals and groups enact organizational resilience in order to meet the practical, social, and emotional needs of their work communities. We discuss three examples of how humans, groups, and technologies are engaging with existing and new work communities

and are enacting resilience, and describe initial lines of inquiry. While it is too early for us to define how we will contribute to concepts and practices for understanding and supporting resilience, meaningful narratives of resilience that must grapple with many different kinds of human infrastructure are already emerging. Prior work in crisis informatics has primarily focused on natural disasters (Palen et al., 2020), which are often shorter in duration; in this research, we focus on a crisis that is taking place over a long and unpredictable timeframe.

Related Work

When switching many thousands of people to remote work and creating new work arrangements at a rapid pace, a key aspect of success is the robustness and appropriate flexibility of the infrastructures an organization uses. The concept of infrastructure has become an important topic in computer-supported cooperative work (CSCW), and has come to encompass far more than just power lines and highways.

(Human) Infrastructure. The term "infrastructure" refers to a technical facility that provides a service to the wider world. Contemporary studies investigate not only underlying infrastructures but also how they interact with other tools, systems, and practices. Infrastructures organize and constrain as well as provide resources for practice. Focused on technical aspects as well as social-organizational aspects, infrastructure research investigates the dynamics of multiple, overlapping sociotechnical systems. An important focus of current research concerns "the dialogic and emergent relationship between work practices ….and artifacts that are part of a larger socio-technical milieu" (Lee and Schmidt, 2018). *Human infrastructure* refers to "the arrangements of organizations and actors that must be brought into alignment in order for work to be accomplished" (Lee, et al., 2006). While it is tempting to see infrastructure as arrangements of objects, protocols, and other non-human entities, people play important and wide-ranging roles in making this infrastructure function and helping it maintain a consistent state of repair and service delivery; in a sense becoming a part of the overall assemblage that constitutes "infrastructure" itself. As physical and logical infrastructure sometimes only becomes visible upon breakdown (Star 1999), many aspects of human infrastructure, such as informal networks of knowledgeable professionals, may be hard to see from the outside most of the time. This combination of people, processes, and resources that helps organizations (and systems of organizations) maintain a reasonable level of consistency in functioning also helps to promote the delicate balance involved in organizational resilience.

Organizational resilience. Organizational resilience (OR) is "the ability of an organization to anticipate, prepare for, respond and adapt to incremental change and sudden disruptions in order to survive and prosper" (Denyer, 2017). It is achieved by balancing tensions between competing behaviors and perspectives, such as between behaviors that are defensive (stopping bad things from happening) and progressive (making good things happen); and those that are consistent, or flexible. Perspectives to be balanced are preventative control, mindful action, performance optimization, and adaptive innovation. "Feedback loops" are created as organizations learn and revisit earlier decisions (Bhamra, Dani & Burnard, 2011). Resilience is

in part a function of an organization's capacity to make internal adjustments to cope with disruptions (Bhamra, Dani & Burnard, 2011).

Social-Ecological Resilience. Holling's (1973) influential description of resilience in ecological systems has had a significant impact on resilience scholarship in "social-ecological systems" (SES). SESs are defined by Redmond, et al. as "a coherent system of biophysical and social factors that regularly interact in a resilient, sustained manner" that is defined at several, possibly hierarchical scales, and constitutes a dynamic system of critical resources regulated by the flow of social and ecological systems (2004). During disruptive events, such as crises, infrastructures may become damaged or become disruptions themselves. People affected by these disruptions may routinely "use, re-appropriate, and build purposeful infrastructure to develop resilience" (Semaan, 2019) and use infrastructuring as a tool to expose power imbalances and biases within existing, dominant infrastructures.

Articulation Work and Coordinated Action. Studies of CSCW and studies of resilience share an interest in understanding the role that different forms of collaboration or "coordinated action" (Lee & Paine, 2015) play in the accomplishment of work. This process-oriented perspective is useful to include because an "organization" can be an artificial boundary when trying to understand complex phenomena. Informal coordination that spans organizations, small groups within organizations, and offline work that people do at home can all be critical for the success and stability of projects and other activities. Arising from key work in sociology such as Strauss's description of articulation work (1988), coordination studies places a spotlight on what it takes to make work happen in a wide range of contexts, and how organizational forms can be developed as part of this work, rather than purely as a determinant of work. Lee's (2015) Model of Coordinated Action, for example, describes dimensions of coordination (synchronicity, physical distribution, scale, communities of practice, nascence, planned permanence, and turnover) that do not require an *a priori* formal organization for useful analysis. The lenses of resilience at the system level (here, organizational and social-ecological) help us identify particular tensions, whereas coordination theory gives us the tools to understand the dynamics of how those tensions are resolved between individual and organizational actors. We will use a coordination studies approach to help chart out the resilience of a system of systems which encompasses many kinds of actors and activities, and which must be both nimble and cautious.

Fieldsite and Methods

Field Site and Context

In March, the Seattle area was considered the epicenter of the pandemic in the United States; extreme statewide social distancing measures allowed the area "flatten the curve" in April and May. In June case counts rose modestly throughout the greater Seattle area. As growth continues throughout the United States—in some regions exponentially—Washington state continues to require or strongly advise continued telework wherever possible. The University of Washington (UW) continues to require telework for all "non-critical personnel."

The UW is not just a place of higher learning but also an economic driver and cultural institution that is well-connected to the local population, making it both a complex and important site

through which to understand the internal and external effects of rapid changes to work practices during the pandemic.

We interviewed and observed members of three groups at UW. We spoke with two academic units: UW's Human Centered Design & Engineering (HCDE) department, and the Epidemiology department. We also interviewed people who were part of an urgent effort to design and manufacture face shields, as well as one medical professional who used prototypes of the face shields. These participants collaborated across UW's three primary academic campuses, as well as two hospitals and a design company. We conducted 29 interviews altogether. Participants were recruited through snowball sampling, department websites, and personal contacts. Interviews were conducted over Zoom and recorded for later transcription and analysis. Interviews were semi-structured and lasted about one hour each, with slightly different protocols for the different primary populations (staff, faculty, students). We also observed faculty and staff meetings. Future work in this project will include other academic and administrative departments.

Ethnography and Modified Grounded Theory

Ethnography is a useful tool to inform the design of collaborative information systems (Anderson, 1994; Hughes et al., 1992), and can play a role in the design of other artifacts, such as work processes (Adolph, Hall, & Kruchten, 2011; Sellen & Harper, 2003). Conducting research as the crisis unfolds moment-to-moment allows us to document and analyze a variety of social and organizational feedback loops, essential but "boring" uses of mundane technology, course corrections, material bottlenecks, and replicable workarounds. The ethnographic work conducted here is both multi-sited (i.e., operating across multiple research locales) and multi-scalar (i.e., exploring phenomena nested at multiple scales). Future analysis will use a *modified grounded theory approach* that, unlike pure grounded theory, looks to existing theory while also iterating codes while in the field to cultivate emergent themes. The efforts of the researchers allow us to work quickly in accordance with the urgency of the project and need for actionable findings.

Preliminary Findings: Examples of Enacting Resilience

We present three examples of resilience in different contexts: distributed collaboration for designing and making personal protective equipment (PPE), faculty experiences with remote teaching, and faculty and students' experiences with working and studying from home. These stories highlight different ways that people enact resilience during COVID-19—through new ways of using resources and infrastructures and through changing organizational boundaries.

Example 1: Utilizing and reconfiguring existing resources in new ways

The University of Washington's face shield project was borne out of an urgent need for PPE as an additional line of defense for medical personnel in close proximity to suspected or known COVID-19 patients. In order to meet these immediate needs and fill the void in the supply chain,

members of a PPE task force had to be creative with utilizing and reconfiguring the resources they had on hand. While the face shield effort was largely reactive to medical exigencies, it also yielded stable resources and procedures that have been useful in subsequent PPE projects.

In mid-March, 2020, while Seattle was considered the US epicenter of the pandemic, Seattle hospitals were running dangerously low on PPE, such as face shields. Face shields are a clear barrier over the face, which is attached to a band that goes around the head. They are designed to prevent droplets containing viruses from infecting the wearer (Perencevich et al., 2020). After hearing about the shortage, a local design non-profit prototyped a face shield that could be produced with fused deposition modeling (FDM) 3D printers and used readily available office supplies for the shield itself. (There were also parallel efforts at the university to develop a face shield design; however, the nonprofit's design was further along in the regulatory pipeline.) This face shield design quickly became part of a larger effort across local institutions to rapidly produce PPE, with almost 40 researchers, scientists, physicians, and makers signing on to a PPE task force within a week of the group being formed.

Soon after, the design went through a new US National Institute of Health (NIH) process for rapidly evaluating whether to recommend 3D printed PPE for clinical use. The design was uploaded to the NIH's 3D Print Exchange website and the printing specifications were made public, which subsequently crashed the website because so many people were interested in the design. In the following weeks, makers became a part of (what one participant called) "hyperlocal" manufacturing, which involved developing manufacturing protocols for each makerspace, configurations for each printer, social distancing and cleaning protocols within these spaces, coordinating work shifts so that printing could be done around the clock, and a procedure for delivering face shields to the hospitals. The network that formed also required translational work between disciplines and professions, the creation of shared vocabularies, and new ways of describing needed changes to prototypes without being collocated.

Participants stressed that throughout this experience, they engaged in creative problem solving, being flexible and innovative when infrastructures that they would normally rely upon were unable to support their urgent and changing needs. The makers had to find ways to handle supply chain shortages, such as finding an alternative to the PETG used in medical FDM 3D printing and creating their own cleaning supplies, as well as a shortage of staff. In the effort to create PPE, spaces and machines were used in ways they were not intended, new networks across organizations were formed, and people took on new roles, all within an environment of uncertainty: about when there would no longer be an urgent need for local production of face shields (as their effort was only meant to be a "stop gap") and when supply chains would recover, and about the changing needs of hospitals. Eventually, Seattle hospitals were able to obtain face shields from corporate manufacturers, and the task force moved on to designing other kinds of PPE, such as medical gowns and endotracheal tube adapter clips, that could also be manufactured in a "hyperlocal" fashion.

A key difference between these other projects and the face shield effort was that now they had resources they had appropriated, reconfigured, and developed for the face shield project at their disposal: networks, procedures, and local supply chains. Working on the face shield had helped them build up organizational resilience. An engineer we interviewed said, *"If there's another surge that overwhelms the medical system, we will have a) the work we've already done and we can fall back on that and to ramp up production again and b) we already have the community and networking available to meet the needs of things that have not come up yet."* He emphasized that these projects would not be able to be completed with one group of people alone—these efforts were successful partly because clinicians identified their needs and engineers and makers from many fields came together to identify novel ways to meet those specifications. Furthermore, in some cases, the production of this PPE could be taken up by the larger maker community beyond the university.

Example 2: Using existing infrastructures to strengthen and expand human networks

Teaching faculty at the University of Washington enacted resilience in support of their institution's educational mission by adapting existing communication infrastructures and using them to sustain or expand human networks within a remote "workplace". These extended networks allowed instructors to share learnings and solve problems related to a sudden shift to remote instruction.

On March 6th, 2020, in response to local community spread of the novel coronavirus, the University of Washington announced a move to online instruction for the final two weeks of the winter academic quarter. On March 18th, the university declared that spring quarter instruction would be entirely remote (Cauce, 2020a). On March 23rd, the Governor of Washington issued a statewide executive order closing non-essential businesses and requiring all residents to "stay-at-home" unless engaged in essential activities such as shopping for food or seeking urgent medical care (Inslee announces "Stay Home, Stay Healthy" order (2020, March 23)). The University of Washington then announced that telework would be required for all "non-critical personnel" (Cauce, 2020b) for the duration of the "stay-at-home" order.

Between winter and spring quarters, UW instructors were tasked with transitioning courses from an in-person learning model to one that would support remote instruction. This was a significant undertaking that required learning new communication and collaboration technologies, extending existing technical infrastructures, and modifying course content and exercises to preserve learning outcomes while allowing students and instructors the flexibility to balance work with personal, family, or community needs. Faculty members in one academic department began hosting drop-in sessions via Zoom to try out features with a live audience, troubleshoot technical issues, and share advice. They added a public *#teaching* channel to their existing departmental Slack workspace to share ideas and answer each others' questions about instructional tools and adapting pedagogy as the department moved to online instruction. This public channel was open to all members of the department and invitations to ongoing Zoom drop-in sessions were shared to it.

Participants across many staff and faculty roles spoke of missing being able to drop into a colleague's office or join a casual hallway conversation. Several faculty members involved in this teaching initiative, however, also emphasized the value of this expanded network and the connections it enabled. The department includes a large number of part-time instructors and offers both day and evening courses. Being able to "jump on Zoom" (as one participant phrased it) rather than commute to campus made it easier for full-time faculty, part-time instructors, and graduate student teaching assistants to come together during mutually convenient times; while the Slack channel provided a space for discoverable group conversations, both synchronous and asynchronous. New conversations and knowledge sharing between instructors who might otherwise rarely—if ever—find the opportunity to connect directly, emerged from these new channels. Participants described feeling a stronger sense of departmental community as a result of this flexibility—a practice many hope to continue even when full-time remote work and strict social distancing become unnecessary.

Example 3: Overlapping household management concerns and organizational concerns

Several participants detailed changes they made in their houses to prepare the space for themselves and their family members for an extended period of working from home. Working from home, per se, was not new to many of the participants. It was working from home while other household members were also working, or attending meetings and classes, that was particularly unique and challenging. Participants undertook various strategies to overcome the challenge imposed by sharing the work and home space with other household members. Participants recognized preparing the workspace as one of the essential early steps for maintaining their job-related duties and also creating the required routine for themselves and, in the case of parents, for their children and family. Participants stated that space transformation and preparation was essential for maintaining the work. For example, a teaching faculty member talked about the changes in their house and explained that after they take care of the basic hygiene and food in their house, they *"...focused on getting the kids settled in their routine, which actually took a long time.... So technologically, there was a lot of stuff to get them up and running too."* The participant elaborated on space transformations in their place: *"So our dining room table definitely has become our centralized hub. I mean, they (kids) have their own folders and workspace …Yeah, it's been a very small house, which I don't mind. But our very small house needs to support like four people doing work at the same time. So that's why I'm sitting on Zoom meetings with my headphones and it is fine. So yeah, that's how our space has changed a bit. Our dining room is now our office for the kids and downstairs is the office for the grown-ups."*

Or another faculty member explained that he made and installed a new curtain in his basement to create a professional background for his Zoom meetings in order to decrease the distraction in his online classes: *"I just put the green screen…this is not about privacy, but it is about*

distraction. It is already distracting enough..." The above examples show people co-opting home resources to support remote working.

Participants also mentioned that they were required to actively coordinate with other family members (e.g., kids, partners, roommates) to maintain work-related practices. For example, one faculty member stated that: *"…We try to switch off times that we can work. So, if he needs like a full morning to focus, we'll do that. If I need a full morning, he'll take the kids. So there's a lot of back and forth like, oh, today we'll take the kids to the park one if the other person needs a little quiet time to work…"* Our data show new coordinating practices and adaptations that overlap the spheres of homes and family with the spheres of their work organizations.

Provocation: Emergent Lines of Inquiry

We are still in the midst of an assertive push to collect data on how individuals, groups, networks, departments and other organizations are enacting resilience. The three examples above are a tiny sample of the data we are collecting and are beginning to analyze. Below we posit questions that represent emergent lines of inquiry for our work in progress.

How is organizational resilience enacted bottom up?

We are seeing examples of grassroots enactment of resilience with individuals taking on the work of creating new networks and leveraging existing work groups. In example 2, we see individuals take on new roles, for example to create online practice groups to use technologies. In example 1, we see people create new supply chains and to access needed resources. At some point, however, the individual needs to take into account institutionalized norms and regulations (e.g. PPE volunteers and NIH regulations). What are the contexts in which individuals can and will enact resilience? What happens when the efforts of formal organizations to enact resilience “meet” individual efforts?

How are the boundaries of formal organizations being redefined?

A pandemic is a crisis that unfolds over time. Crisis events force individuals, groups, networks and departments to undertake activities not previously in their purview. Informal organizations are often called upon, or created, to pick up the slack. In the above examples some new work practices fall within the bounds of the formal organization, such as people undertaking new responsibilities to help people in their department. In the PPE and work-family balance examples we see people stepping out of their departments and, if one considers a family unit a type of organization, we see family members need to coordinate to enable each member to do school or professional work. We also see home resources being used for the greater good of formal organizations.

How do people reorganize their activities when they cannot work remotely or can only partially work remotely?

So far, we have mostly spoken with people who were able to work remotely—with the notable exception of medical personnel and makers. However, many at UW, like other organizations, must still come in to work, sometimes placing themselves in harm's way, such as cashiers and custodial staff. How have measures put in place by the University affected them? How "universal" are the stressors of the pandemic, and how broadly effective are the techniques used to cope with these stressors? In order to make useful claims about how work is changed, we must understand a broad spectrum of work that is taking place.

Which practices and arrangements are sustained over time? How will activities evolve from being more reactive and improvised to more proactive and formal?

Our interviews and observations demonstrate that early in a disruption, people adapt quickly and improvise. In the face of urgent needs, such as for new ways of teaching or producing PPE, our participants take on new tasks, roles and projects entirely. Questions are already arising among our participants about what new practices and tools they would continue using if things go "back to normal". This latter question is already an interesting area of inquiry. However, as the pandemic continues to play out—there has been a new viral outbreak next to the UW campus among the fraternity houses and infections are rising nationwide—longer term and thus higher stakes planning and changes are required. Investigating which practices and arrangements are sustained over time resonates with CSCW conversations about the role of boundary objects and boundary negotiating artifacts (Lee, 2007) and attendant practices in stabilizing or destabilizing designs. Also implicated are questions about how infrastructures are created and how they build on and are constrained by existing infrastructures. The pandemic as an unfolding phenomenon creates, among other shifting frames, shifting *temporal* frames. It will likely be fruitful to explore how people plan and strategize differently based on their expectations of the future.

Conclusion

Current models of "teleworking" and "nomadic work" (Brown and O'Hara 2003, Ciolfi and de Carvalho 2014) are focused on the experiences and creativity of individuals. Research in HCI and CSCW have shown time and again that it is not enough to insert technology into a situation; people and organizations need technologies that fit or can be adapted to actual work practices, and organizations must be able to quickly and dynamically adapt those practices to changing situations—requiring complex n-way coordination.

People and organizations need technologies designed to fit or be adapted to actual work practices. Resilient organizations must dynamically adapt. Our infrastructural perspective provides us not only with the opportunity, but also the charge, to look at both formal and informal organizations—and their attendant technologies—to investigate the dynamics between them in order to comprehensively understand adaptation. Guided by our initial set of interviews and the questions they have stimulated, this project will develop evidence about how organizations and diverse people are transformed by transitioning to remote work. It will also develop vital guidance for individuals, groups, networks, departments on a full range of activities

that effectively support resilient organizations and work communities during the COVID-19 response, as well as future pandemics and other long-term crisis events.

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