Mapping Risk Work and Designing Technologies to Support it in CSCW Research

MYEONG LEE, George Mason University, USA
G. MAURICIO MEJIA, Arizona State University, USA
RACHEL B. WARREN, University of California, Irvine, USA
YUNAN CHEN, University of California, Irvine, USA
HIBA SIRAJ, George Mason University, USA
MELISSA MAZMANIAN, University of California, Irvine, USA
RUCHITA ARVIND MANDHRE, Arizona State University, USA
KATHLEEN H. PINE, Arizona State University, USA

Abstract

This workshop brings together CSCW scholars of various domains, such as medicine and healthcare, disaster planning, and public safety, to consider different dimensions of risk work and their implications on computing. Risk work encompasses the practices through which workers assess, manage, and mitigate potential harms in situations framed by uncertainty. In the face of a pervasive rhetoric of crisis, risk work is expanding and evolving as workers and laypeople are increasingly charged with preventing, predicting, and communicating risks. The changing landscape of risk work is coupled with expanding technical infrastructure that shapes communication, determines information sharing, and includes technologies of data collection and prediction. In this workshop, we aim to examine the challenges and opportunities in designing computing systems that support risk work in order to develop a research agenda for studying the future of risk work. Participants will come ready to present on case studies of risk work. We will then engage in collaborative mapping exercises and design practices to identify both the potential and pitfalls of technologies to support risk work. The workshop will culminate in a shared research agenda and design strategies for the future of computing in risk work contexts.

Additional Key Words and Phrases: Risk work, technology infrastructures, crisis informatics, health informatics

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Authors' Contact Information: Myeong Lee, mlee89@gmu.edu, George Mason University, USA; G. Mauricio Mejia, mauricio.mejia@asu.edu, Arizona State University, USA; Rachel B. Warren, rwarren2@uci.edu, University of California, Irvine, , , USA; Yunan Chen, yunanc@ics.uci.edu, University of California, Irvine, USA; Hiba Siraj, rhsiraj@gmu.edu, George Mason University, USA; Melissa Mazmanian, m.mazmanian@uci.edu, University of California, Irvine, USA; Ruchita Arvind Mandhre, , Arizona State University, USA; Kathleen H. Pine, khpine@asu.edu, Arizona State University, USA.

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1 Introduction

"Risk work" refers to working practices centered on the concept of risk, such as how workers identify and manage risk in particular situations [25, 29]. This encompasses work from using tacit knowledge and on-the-fly responses to codified practices and large-scale data analysis. Historically, computation and data have shaped risk work (e.g., early public health efforts mapped the spread of plague [8, 24]). Today, in a world both saturated with crisis rhetoric and driven by data-based predictive technologies, more people and organizations are adopting risk management approaches and tools. Still, CSCW and critical computing scholars have largely examined risk work in separate domains–such as crisis informatics [41, 46, 47], health informatics [19, 39], and urban informatics [17, 23]—rather than through a unified lens. This workshop will bring together scholars in different domains with a twofold goal. First, we aim to identify the dimensions of risk work that might be often studied through different frameworks. Second, we aim to engage in a generative activity to co-define effective design practices that support diverse types of risk work. We expect to approach studies of risk work more systematically by collaboratively creating a reference framework and brainstorming the potential directions for design practice for risk work.

Risk work is changing and expanding. Professionals in a variety of domains are increasingly responsible for identifying and managing risk. For example, healthcare workers are expected to practice preventive medicine [28], social workers are expected to identify 'at-risk' youth before they become deviant adults [13, 37, 43], and police officers are tasked with preventing crime before it occurs [5]. These shifts reflect a broad expectation that as technologies of tracking, predicting, and analyzing data become more robust, so should our ability to track–and in many cases prevent–crises. As individuals are expected to take responsibility for their health, care work, disaster readiness, risk work is also intensifying in everyday life [39, 46]. This phenomenon points to the need to study risk work not just within the realm of professionals who hold traditionally legitimized risk knowledge, such as public health workers or disaster planners, but also as informal yet skillful labor that people undertake themselves to assess and manage known risks.

Often, pressures to engage in risk management activities are motivated by the goal of preventing adverse outcomes and are coupled with the introduction of complex data collection practices and modern predictive algorithms. For example, social workers are tasked with using simple algorithms to identify youth at risk of abuse [14, 43] or individuals who are likely to need long term unemployment benefits [2, 45, 52]. Data tools, especially dashboards, are also used in healthcare settings to help providers identify "at risk" patients [1, 6]. Some critiques of technologies of risk work are well known. Scholars have found that these technologies can at times introduce undue surveillance and perpetuate historical bias [4, 9, 36]. Further, studies have found that risk prediction technologies can undermine the professional autonomy and identity of risk workers by undermining workers' situated knowledge and discretion [10, 27, 48], negatively impact workers' relationships with clients [3, 11], and create demands for additional labor in the form of data collection processes ("data work") [38]. From a design implementation perspective, another challenge is that risk work technologies usually rely on re-purposing infrastructure developed for a different purpose [22, 43, 50, 51].

These research findings lead us to ask: What better infrastructures are needed to support multiple forms of risk work? And, what obstacles prevent individuals and organizations from developing this infrastructure? Even as they proliferate, technologies of risk work are rapidly changing and are often resisted by those who are intended to use them [12, 15]. This presents a timely opportunity for computing scholars to develop better ways to design and evaluate socio-technical systems that help individuals, organizations, communities, and societies manage risks.

Preliminary Dimensions of Risk Work: The multidimensional nature of risk work makes designing, implementing, and managing information technologies that support risk work challenging. From organizers' various studies of risk work (e.g., fire departments, 911 dispatch, and individuals' management of COVID-19 risk), we have identified some preliminary dimensions of risk work. However, given the complexity of risk work and recent explosion of technologies that increase our ability to track, analyze, and predict events, this is only the beginning. In this workshop, we hope to draw upon different case studies and disciplinary perspectives to expand and refine these dimensions. Together we will map new cases onto our preliminary analysis and expand our collective understanding of the socio-technical dimensions of risk work.

- **Preventive vs. Reactive:** Risk work can be done both before an emergency occurs (preventive risk work) or after the event (reactive risk work). For example, fire departments are mostly concerned with responding to incidents to prevent them from spreading and impacting life, property, and environment safety. However, our initial study also found that fire departments conduct community risk assessments to mitigate risks before they happen.
- **Spatial scale of risk work (large vs. small):** Risk work can range from practices regarding small-scale incidents (e.g. car crashes) to more universal crises, like earthquakes.
- **Formal vs. Informal:** Risk work practices in professional settings are provided and governed by employers, thus the burden of risk work is shared between individuals and their environments (i.e. workplaces provide protocols, risk assessment tools, equipment, etc). However, laypersons are increasingly conducting intensified risk work in the home [39]. For example, during the COVID-19 pandemic individuals assessed risks and adopted appropriate risk practices.
- **Temporality of risk work (sudden onset vs. gradual):** Risk work is carried out for risks with varying speeds of onset. Wildfires an example of sudden onset of risks for people residing in the area, whereas the opioid crisis is an example of a gradual onset crisis.
- **Embeddedness of risk in locations:** Risk is often embedded in a physical location and emerges with aggravated conditions. For example, while tsunamis impact everyone in a geographic area, heat deaths are less visible and target only vulnerable individuals. Conversely, there are risks that exist regardless of physical locations, such as COVID-19 or opioid addiction.

2 Means of Recruiting and Prospective Participants

We invite participants who study risk work both historically and in practice, drawing from diverse backgrounds and contexts. We will recruit participants through social media, the organizers' personal networks, and relevant mailing lists. A dedicated website with a call for participation (CFP) will request two-page position papers that either present a case study of risk work or propose a provocation for studying risk work. The organizers will then review the submissions and notify selected participants to confirm their in-person attendance.

We anticipate about 15–20 participants (with a maximum of 30). Each participant should come prepared to deliver a three-minute lightning talk, either introducing a case study or posing a provocation on risk work research, while highlighting key dimensions that affect risk work. These talks should include a brief overview of the risk work context, along with any relevant theoretical framework or technology. We may also ask participants to bring a tangible artifact related to risk work for discussion in the second part of the workshop.

3 Workshop Format and Planned Activities

The workshop will be a one-day, hybrid workshop, including lunch and coffee breaks for in-person participants. The main activities of the workshop will be divided into three parts.

3.1 Part one: Mapping risk work

Part one of the workshop will take place in the morning and will focus on answering the questions: What kinds of computer-supported risk work exist and how can they be mapped on the dimensions of risk work? We will meet this objective through first conducting lightning talks (3-5 minutes) by each participant of the workshop focused on how risk work relates to their case. Participants will then engage in an activity in which they map their risk work cases onto the dimensions outlined above in both small groups and as a larger collective. Part one is focused on expanding and refining the dimensions of risk work.

3.2 Part two: Computing for risk work

Part two of the workshop will take place after a break and focus on discussing strategies and risks for computing across the different dimensions of risk work. We will explore how concerns such as privacy and data integration arise from technologies and systems designed to support risk work, and how computing technologies and systems can be developed over the long term to support risk work and risk workers while attending to dangers posed by risk handling tools themselves. We will begin with an artifact analysis activity in which participants will present a specific tool or system used to support risk work that is related to their research. Participants will be asked to explain how their artifact supports risk work, the specific practices involved in using it, and the negative consequences that could or do arise from its use. Using this presentation as a catalyst, we will then divide into small groups to discuss how computing systems should be developed over the next 10 years. Participants will discuss both the future of computing tools and systems for risk work as well as the research agenda needed to support development of risk work tools and systems.

3.3 Part three: Exploring design space for risk work

In part three, we will conduct a collective activity to identify good design practices for creating and improving technologies for risk work. We will map out and critique design practices based on the following preliminary set of categories from the literature and our previous work.

- **Design participation**: The roles of experts and other stakeholders in the design process can vary depending on how much control participants have. Design practices may be human-centered but with limited participation driven. These human-centered design practices are driven by experts who work efficiently for clients [33], focus on user needs [34] and seek insights from users (e.g., [26]). In collaborative practices, designers of technologies and systems may collaborate with other experts and stakeholders in some activities [42]. And in an ideal participatory design, design decisions are on the hands of those who use and enact technologies [7]. These different design participation practices have potential shortcomings such as missing out real human needs because of the rigid design agendas in human-centered design [49] or the pseudo participation [35] or high-resource requirements [31] of participatory design.
- **Design activities**: Giving the complexity of designing for risk work, we aim to move beyond commercial and prescriptive design methods [18, 20] and identify different activities from framing and strategizing design challenges, to prototyping concepts, to implementation and enactment. In our previous work on a case of

co-design for risk work [32], we identified framing, sense-making, visioning, ideating, prototyping, testing, piloting, implementing, enacting, and adjusting. We will use these broad design activities as a canvas to discuss potential and priority action in designing risk work technologies.

- **Design time**: The consideration of time in addressing design for risk work can be oriented towards past, present, near-term future, or longer-term future. Past refers to evidence-based design practices where case studies and data inform the design decisions (Hall). Present is based on intuition and experience of what practitioners consider to be effective to address the problem [16]. Near-term future is based on intuition and generative thinking to imagine future-states (e.g., [40]). Longer-term future practices are speculative [21] and anticipatory in third order horizons [30, 44].

We will create a simple template on the wall to collectively identify the practices in case studies provided by the participants. We will explain practices in these three categories and invite participants to consider other practices and new categories. Workshop participants will use sticky notes, markers, and stickers with icons to identify, assess, and discuss practices. In a second round, we will discuss how to design effectively in these practices and critique what is needed or not to design technologies for risk work.

4 Intended Outcomes

We expect to deliver (1) the refined risk work framework that details the nuanced dimensions and (2) a conceptual paper or a white paper derived by the discussion of this workshop, combined with the position papers submitted by the participants. We will also maintain a Slack channel and Google Drive to maintain the community of risk work researchers and continue the discussion after the workshop.

5 Equipment and Supplies Needed

As this workshop focuses on collaborative sessions in both small and large groups, we will need large cardboard sheets, markers, and sticky notes. Additionally, for the position paper presentations, a computer and a projector are necessary.

6 Organizers

Myeong Lee is an Assistant Professor of Information Science and the Director of Community Informatics Lab (CIL) at the Department of Information Sciences and Technology at George Mason University. His research interests are in understanding the dynamics of local communities, technology-enabled groups, and information inequality.

G. Mauricio Mejía is a Professor of Design at Arizona State University. His current work is about strategic design and intentional change. He explores how designers can address complex situations and how other practitioners use a design mindset. He often collaborates with practitioners and researchers in other fields, such as health, sustainability, business, and education. Dr. Mejía studies and works with diverse design practices and approaches such as design research, service design, experience design, co-design, and design futures. At ASU, he established the Transformation Lab.

Rachel Warren is pursuing a PHD in Informatics at the University of California, Irvine (UCI). Her work focuses on the implications of predictive technologies particularly the public sector, specifically as they impact of the work of fire paramedics, 911 dispatchers, and disaster planners. She is also interested in identifying the technology needs of civil servants and is actively engaged in building technology to help assist investigative journalists and public defenders. Prior to her academic work Rachel worked as a machine learning engineer and data scientist in industry.

Yunan Chen is an Professor of Informatics at the University of California, Irvine (UCI). Her area of research lies at the intersection of human–computer interaction (HCI), computer supported cooperative work (CSCW), and health informatics. She is interested in studying how health information is generated, managed, shared, and utilized to drive better care in both clinical and patient-oriented settings.

Hiba Siraj is a PhD student in the Information Science and Technology department at George Mason University in Fairfax, Virginia. Her research interests are data work in emergency response, information behaviors in crisis situations, and the use of ICTs in information sharing and risk management. Her research explores how Emergency Medical Service (EMS) responders are leveraging technologies in diverse spatio-temporal settings for incident management.

Melissa Mazmanian is a Professor and Chancellor's Professor of Informatics at the Donald Bren School of Information and Computer Sciences and, jointly, of Organization and Management at the Merage School of Business at the University of California, Irvine. Melissa's research interests revolve around the use of digital technologies in personal and organizational contexts, specifically in relation to everyday work practice, communication patterns, and the nature of time in the digital age.

Ruchita A. Mandhre is a PhD Candidate in Design at Arizona State University. Her doctoral research explores how prototyping can support strategic co-designing for change. Areas that inform her work include participatory design, strategic design, design futures, design for change, among others.

Katie Pine is an Associate Professor in the College of Health Solutions at Arizona State University. Her interdisciplinary work lies at the intersection of health informatics, human-computer interaction (HCI), computer supported cooperative work (CSCW), and organization studies. She draws on and contributes to these fields with a focus on technology and work in healthcare. Her work specifically examines how people use information and communications technologies (ICTs) as part of healthcare practice and how the design of ICTs, the contexts of ICT use, and the ways that people use ICTs impact how people give and receive healthcare, most recently in the context of prehospital medicine delivered by fire departments. She utilizes primarily qualitative methods and collaborates to conduct team-based mixed methods studies and action research in concert with community and clinical partners.

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