"Showing the Context": A Need for Oligopticonic Information Systems in Homelessness Measurement

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Organizations like businesses, governments, and nonprofits often have established milestones to stay focused on their strategic goals. However, public and social sector organizations often have goals that are difficult to measure. To better understand how data can be more sensitively appropriated in difficult-to-measure contexts, we conducted design workshops with 25 individuals with a stake in how homelessness is measured—including funders, staff and people experiencing homelessness. This study provides a detailed account of how diverse stakeholders measure progress towards these often difficult and vague goals. We found that the approaches to data collection fall under either the sociocentric perspective (which seeks to answer questions about community-level impact) or the egocentric perspective (which focuses more on the experience of the individual experiencing homelessness). We argue that in contexts where goals are vague and difficult to observe or measure, collaborative information systems should be approached by combining the sociocentric and egocentric perspectives into an oligopticon, rather than focusing only on the sociocentric perspective (which can be understood as a panopticon). As we outline, oligopticonic information systems have the capacity to deal with more diverse types of data and experiences by embracing the requirements that we have outlined.

CCS Concepts: • **Human-centered computing** → **Empirical studies in collaborative and social computing**; **Computer supported cooperative work**; **Collaborative and social computing theory, concepts and paradigms**.

Additional Key Words and Phrases: data; homelessness; outcome measurement; impact evaluation; decision making; context; sociocentric; egocentric; panopticon; oligopticon; design workshops

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1 INTRODUCTION

Organizations like businesses, governments, and nonprofits often establish and track milestones in information systems to stay focused on their strategic goals. This is difficult in the public sector, however, because "public sector organizations often pursue goals that are vague and difficult to see or measure," making it difficult for an organization such as a local housing agency to tell if it "...is doing well" [11]. Given that many nonprofit organizations have missions to achieve social change, scholars have argued that it is important for nonprofits to "know how effectively they are performing their jobs. Are their programs achieving the desired results? How could programs be modified to improve those results?" [32]. However, metrics like a count of occupied housing units or results from a periodic survey of residents often lack enough context for the housing agency

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to reliably track progress against their goals (e.g., community-wide equitable access to housing). While it is understood that public and social sector organizations have more difficulty in measuring progress towards their goals, there is less understanding of how exactly this work is approached by individuals throughout the community using information systems.

To better understand how data can be more sensitively appropriated in difficult-to-measure contexts, we conducted design workshops with 25 individuals with a stake in how homelessness is measured in one metropolitan area in the United States. In this study, we asked participants to workshop their personal and cooperative approaches to collecting and analyzing data. Participants provided detailed accounts of how and why they work with others across the community to use data to measure progress towards their often difficult and vague goals.

We found that approaches to data collection fall under two perspectives. The first is the sociocentric perspective which seeks to answer questions about community-level impact, and the second is the egocentric perspective which focuses more on the experience of the individual who is experiencing homelessness. Our analysis found that the sociocentric perspective is more highly valued by stakeholders for its ability to convince relevant audiences to invest in homelessness services, and to provide so-called "hard" numbers that are more charismatic. The egocentric perspective is more conducive to supporting the day-to-day management of homelessness services, yet is seen by stakeholders as suffering from an inability to generate charismatic "hard" numbers.

This study builds off of other work in CSCW and HCI that has explored the use of data across scales of decision-making authority in public and social sector organizations (most notably Le Dantec and Edwards [23], Verma and Voida [34] and Karusala et al. [19]). This study builds on this work to 1) offer new information system design ideas for the public and social sector that were derived from workshops with expanded participation (i.e., people experiencing homelessness), and 2) provide a concrete example where it is fruitful to understand users' needs through the oligopticon construct. While Foucault's construct of a panopticon [13] has been a historically relied upon model to understand computer-supported cooperative work (e.g., [3, 15, 16, 33]), particularly when there is some level of surveillance, it falls short in this context because it does not offer an approach that might support the diverse needs of community members. Applying the oligopticon construct to this context—and potentially others that are similar—allows us to think through the design process in a way that will better support the needs (importantly including privacy) of a diverse groups of users.

We argue that in contexts like the one examined here—where goals are vague and difficult to observe or measure—rather than approaching information systems as panopticons, they should be approached as oligopticons to accommodate more diverse types of data and experiences. Oligopticons foreground the necessity to approach data collection from multiple connected sites, and emphasize that decisions must always be made based on partial data because not all of the world can be represented [20].

2 RELATED WORK

To support the exploration of data use by public and social sector stakeholders, in this section we will discuss what is known about the audience for data and the challenges that these stakeholders introduce into the data work. We will also cover the ways that different stakeholders at different scales share data and approach decision making, often in the absence of consensus.

2.1 Outcome Assessment

The process of measuring progress towards desired results is referred to as outcome measurement or assessment. "Used appropriately, outcome assessment...inform[s] a wide range of decisions about whether and how programs should be continued in the future and satisfy funder requirements" [32].

As this quote highlights, outcome assessment has dual audiences and purposes: for the organization in its decision-making about the implementation of programs, but also for funders who want to hold organizations accountable.

Despite the importance of outcome-related data for decision making and for accountability, research has found that organizations lack adequate financial and human resources to engage in data work (e.g., Bopp et al. [5], Erete et al. [12]). For the data work that organizations manage to do, power dynamics in the sector have prioritized funder needs for accountability data over organizational needs for operational data. HCI researchers have noted that this prioritization is troubling, given that operational data would be more helpful to the organizations that are spending the time and resources on the data work in the first place [1, 5, 22, 23, 31, 36]. Nonprofit scholars and practitioners have argued that not only is it difficult to measure nonprofit work, but a "focus on outcomes is anathema to civil society" because it uses human resources and funding that would otherwise be dedicated to the community [9].

2.2 Data across Stakeholder Scales

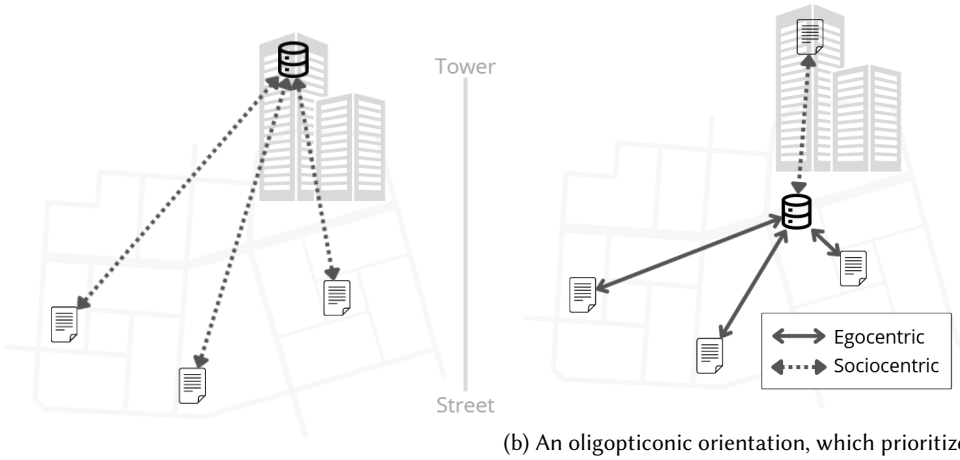
The nonprofit sector is not, however, only comprised of nonprofit staff and funders—there are many different stakeholders [10]. In another HCI study that also focused specifically on the area of homelessness services, Le Dantec and Edwards [23] explain that these different stakeholders operate under various "scales of influence and accountability." Information sharing occurs across and within local service providers; city and county governments; and regional organizations that coordinate across cities, counties, state, and federal scales [2, 23]. Other HCI research has found that additional information exchange occurs between staff and people experiencing homelessness [24], as well as between people experiencing homelessness and others in the community (e.g., family and friends) [21]. Despite the information being exchanged across multiple scales, the predominant focus on using data for accountability and the low priority of client data privacy means that information systems are still designed to prioritize accountability almost exclusively to higher levels [23, 30].

Nonprofit staff often disagree with the way that those in positions of power (e.g., funders or governmental institutions) have operationalized their values through these data systems [19, 35, 36]. Research has shown that across a wide array of domains, these politics are operationalized—and therefore visible—in information systems (see e.g., Bowker [7], Bowker and Star [8], Pine and Liboiron [27], Voida et al. [35, 36]). While many stakeholders across the entire range of scales can often agree that social change is needed, the specific approaches are often contested [35].

2.3 Stakeholder Disagreements about Qualitative Data

There is also disagreement among stakeholders in terms of what counts as data [28, 34, 36]. Individuals who are not as familiar with the work of a particular nonprofit often view qualitative data as either less valuable or irrelevant [32]. However, those who are either more familiar or more deeply involved in the work of the organization feel that quantitative metrics are misleading, especially in comparison to their own qualitative accounts [29]. While there is disagreement about the role of each type of data, many stakeholders believe that qualitative data should be used to supplement quantitative data (often framed in economic terms) in order to tell stories—especially to garner financial support [12, 19, 28].

However, HCI and CSCW researchers have found that qualitative data are more than just supplemental stories, they are the essence of nonprofit work, yet these data are largely not supported by the information systems that nonprofits rely upon [19, 26, 34]. As Thomas [32] explains, "disdaining qualitative data further limits the ability to assess a program because the goals of most public and nonprofit programs are too subjective to be measured only by quantitative techniques". In the face of such a lack of support for qualitative data from both the information systems and those in



(a) A panopticon orientation, which prioritizes sociocentric perspectives using standardized forms and structured data housed within a database in a tower above the city below it. People on the street are data sources that can be gazed down upon from a sociocentric perspective.

(b) An oligopticonic orientation, which prioritizes both sociocentric and egocentric perspectives equally, does not house the database in a tower. Rather, the tower is valued as yet another vantage point to consider while also viewing the individual experiences of people on the street from an egocentric perspective.

Fig. 1. Panopticon vs Oligopticon Visibility

positions of power, this research allows us to better understand how qualitative data can be valued as more than just a supplemental story by modeling information systems around oligopticons rather than panopticons.

2.4 Panopticons, Panoramas and Oligopticons

Our use of the term panopticon in this paper refers to Foucault's [13] metaphorical translation of an architectural design commonly used in 18th century prisons. In HCI and CSCW, panopticons have been frequently leveraged as a metaphorical device to examine surveillance and control in context including Amazon Mechanical Turk's surveillance of workers [16], government corruption in employment programs [33], management of open-source software management [15], and for location tracking in families [3].

The physical prison design that Foucault draws upon uses a single guard tower in the center of a series of cells that allows the guard to be able to see all prisoners at once. Since the prisoners have no way of knowing if they are being watched by the guard, they must operate on the assumption that they are under constant surveillance. In this paper, we will argue that these panopticon prison guards have adopted a sociocentric perspective (or community-level view) by observing the world from afar (see Figure 1a). They can see all that is occurring around them and therefore believe that their view is complete.

2.4.1 Panoramas. In criticizing what the prison guards can see, Latour [20] refers to their view as a panorama. While the panopticon maintains its supposed strength by assuming that the guards see everything, Latour [20] explains that "they also see nothing since [panoramas] simply show an image painted (or projected) on the tiny wall of a room fully closed to the outside." While the image on the wall seems to be complete, the disconnected nature of the room makes it impossible for the

prison guards to realize how limited their perspective in fact is. The metaphor of the panorama can be widely applied, as explained here:

> "[Panoramas] are all over the place; they are being painted every time a newspaper editorialist reviews with authority the 'whole situation'; when a book retells the origins of the world from the Big Bang to President Bush...What is so powerful in those contraptions is that they nicely solve the question of staging the totality, of ordering the ups and downs, of nesting 'micro', 'meso', and 'macro' into one another. [20]

Throughout this paper we will therefore use the term panopticon to refer to the surveillance structure itself, while using the term panorama to refer to what is visible from the panopticon's tower.

2.4.2 Oligopticons. As Latour explains, instead of seeing all, the oligopticon allows us to see "sturdy but extremely narrow views of the (connected) whole" [20]. For example, one cannot understand capitalism in its entirety but instead can see narrow views of it from the Wall Street trading room. Such a room is considered a *center of calculation*, or a site "where literal and not simply metaphorical calculations are made possible by the mathematical...format of the documents being brought back and forth" [20]. The concept of the oligopticon was first applied to information systems and compared to panopticons by Bowker within the context of biodiversity databases [7].

To understand the world through an oligopticon, one must venture out beyond the center of calculation where the panopticon prison guards sit to other sites (see Figure 1b). In the capitalism example, one might also need to visit shopping centers and market stands to see capitalism from a different perspective. The oligopticon approaches each site to be examined as part of a broader array of connected sites that together represent the world [20]. The oligopticon does not suggest that the panorama discussed above should be left out, but rather embraced as one site of many to explore:

> "[A panorama's] totalizing views should not be despised as an act of professional megalomania, but they should be added, like everything else, to the multiplicity of sites we want to deploy. Far from being the place where everything happens, as in their director's dreams, they are local sites to be added as so many new places dotting the flattened landscape we try to map." [20]

3 METHODOLOGY

In this section, we will discuss the bigger picture of how this study was grounded and informed by community need. This orientation resulted in the development of workshops to bring stakeholders together to discuss how and why they work with others across the community to use data to measure progress towards often difficult and vague goals. Following a discussion of the initial community-based research design process, we will briefly explain the context for the study and outline who participated in each workshop. We will also discuss the specific activities that participants engaged in to facilitate discussion, and we will end the section by discussing how our data was analyzed.

3.1 Community-Based Research Foundation

We designed this research to align with the values of community-based research, which emphasizes that community members should be actively engaged throughout multiple phases of research [17]. To identify research that is important to the community, the first author attended a city's cross-organizational meeting. A major point of discussion in this meeting was the alignment of outcome metrics, a topic that has come up in prior research as well (e.g., [1, 5, 22, 23, 26, 34]). Through several iterations of study design, we determined that a focus on outcome metrics provided a unique perspective on not only a community need but also one that would address our research focus on

understanding the construction and use of data representations by a diverse set of stakeholders. This study was reviewed and approved by the authors' Institutional Review Board.

3.2 Geographic and Public Policy Context

Research participants were recruited from a metropolitan area in the Western United States. This geographic region is characterized by one large city that is surrounded by several smaller cities. All organizations and individuals involved in this research fall within a single 'Continuum of Care' as defined by the Department of Housing and Urban Development (HUD), the federal agency charged with overseeing much of the government-funded homelessness services in the United States. A single continuum represents a geographically proximate area where organizations are incentivized to cooperate through centralized administration, funding, and data systems.

A 1987 Congressional Act (McKinney-Vento Homeless Assistant Act) requires that all organizations receiving federal government funding engage in regional coordination of funding and services. This act also requires organizations that receive federal funding to aggregate data about homelessness into a single regional-database called the Homeless Management Information System (HMIS). However, organizations that do not receive federal funding are not required to report data. The organizations represented in workshops three and four do not receive federal funding and therefore do not participate in HMIS. Organizations represented in workshop two participate in HMIS, and the funders in workshop one administers the regional HMIS.

3.3 Participants

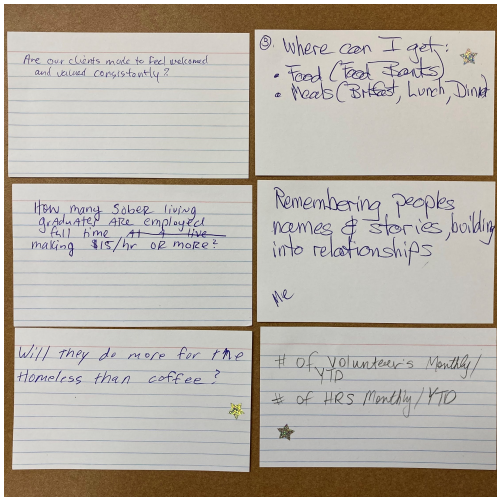
3.3.1 Motivation for Diverse Participation. In a systematic review of HCI literature, Bopp and Voida [6] found that despite HCI researcher's focus on nonprofit organizations, nonprofit clients have been largely neglected as research participants. They also found that very little research has engaged across nonprofit stakeholder groups (i.e., clients and staff), which would help allow researchers to "better understand where conflicts might occur between needs and values" [6]. To meaningfully engage with nonprofit clients—among other important stakeholders—we planned activities for workshops in which multiple stakeholders (e.g., funders, staff, and people experiencing homelessness) would be brought together to discuss outcomes and the data-based representations that are constructed to assess them.

3.3.2 Recruitment. We began by contacting local leaders in government and nonprofit organizations to ask if staff in their organizations were interested in participating in the study. We also requested that staff members speak to clients about participating in the study. The main homelessness funding organization in the region also included an advertisement for the study in their newsletter, which was distributed broadly across the region. All interested parties that contacted researchers were followed up with and provided additional information about the study.

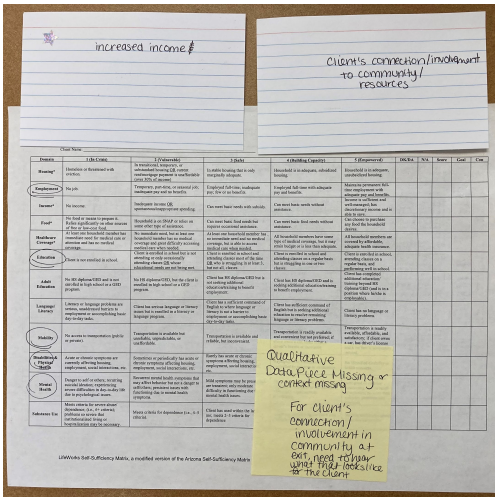
3.3.3 Participant Breakdown. Workshops included a mix of stakeholders, who are described in Table 1 as one of the following: employees of an organization tasked with obtaining and distributing funding (funders), individuals tasked with managing front line staff and volunteers (managers), staff members and volunteers who work directly with people experiencing homelessness, and clients who are currently or have formerly experienced homelessness. A total of 25 individuals participated in a total of 5 workshops, each with a different composition of stakeholder groups.

Table 1. Workshop Participants

Workshop	Funders	Managers	Staff	Volunteers	Clients	Total
1	3	-	-	-	-	3
2	-	2	3	-	-	5
3	-	-	-	5	-	5
4	-	3	1	-	3	7
5	-	-	-	-	5	5
Total	**3**	**5**	**4**	**5**	**8**	**25**



(a) Outcome index cards. Cards with a star sticker indicate that there is data collected on a form to help inform this outcome.



(b) A marked up form and associated outcome cards. The post-it note indicates data that the participant thought should be added to the form.

Fig. 2. Example Workshop Artifacts

3.4 Workshop Logistics

The first author facilitated a total of five in-person[1] workshops, each lasting approximately 90 minutes. In these workshops, participants engaged in activities that were generative in nature: writing down outcomes on index cards (see Figure 2a), sorting those cards, and comparing cards to paper data collection forms (see Figure 2b). Outside of the generative activities, discussion operated as a focus group—with a researcher acting as the facilitator to guide participants through discussion, and to encourage individuals to speak to one another about their experiences. The generative activities were designed to ground participant discussions in specific outcome metrics and data points.

Participants who attended the workshop on their personal time (i.e., not as part of their job) were compensated with a $20 gift card at the end of the workshop.

[1]These workshops took place in January 2020, immediately before the COVID-19 pandemic became a widespread concern in the United States. Therefore no adjustments (such as social distancing) were necessary.

3.5 Workshop Activities

All workshops were comprised of two sections. In the first section, participants were asked to use index cards to record outcome metrics and stakeholders that are interested in such metrics, as shown in Figure 2a. Once these cards were created, we asked participants to discuss their cards for 15-20 minutes as a group. These discussions centered on topics such as the identification of themes across outcomes, reasons why certain data were not collected, the difficulty or ease with which certain outcomes could be measured, and why certain outcomes were valued over others by different stakeholders.

The second section focused on mapping and discussing data elements from forms to the outcome metrics identified in part one. Participants were asked to examine blank printed forms commonly used by organizations that work with individuals experiencing homelessness[2] to find data fields that would help make decisions about one of their outcome metric cards, as shown in Figure 2b. In line with the expectations of a future workshop [18]—which allows participants to not only critique the present but also imagine a new future—we also asked participants to use post-it notes to add or hide form components as they saw fit. Following this individual work, participants discussed their experiences for 25 to 35 minutes. Topics that were covered included the extent to which the outcome was supported by data, form fields that were missing, changes that should be made in the future, and what would be involved in making those changes.

4 DATA ANALYSIS

We started our analysis process with workshop #4 which included discussion across the broadest number of stakeholders (including clients), and workshop #5 which involved clients-only. By starting with these two workshops, we analytically foregrounded the experiences of people who are currently or have in the past experienced homelessness. As noted earlier, HCI researchers have typically foregrounded the voices of nonprofit staff over clients, and this approach to analysis aims to address this imbalance.

4.0.1 Open Coding. Our analysis process involved listening to each workshop transcript, summarizing, and time stamping participant statements so that they could be easily referred to in the future for more close transcription. When discussions were particularly rich, we transcribed these sections word-for-word during this initial analysis phase. Following this end-to-end analysis of each workshop, we applied open codes to the collected data. As necessary, we referenced workshop artifacts including index cards and modified forms to add additional depth to our open codes. Some example open codes included a community orientation; specific outcomes or metrics like recidivism, increases or decreases in mental health symptoms; and objectives like being able to compare one organization's programs with another organization's.

4.0.2 Axial Coding. Following the initial round of open coding as described above, a total of three rounds of axial coding were completed, with each round returning to transcribed quotes to remain grounded in data. At the end of each round of coding, the first author memoed each of the axial codes and then discussed these memos with the second author. The first round of axial codes focused on the data-based representations that were limited in some way: by scope, area of concern, or in terms of the client's lived experience. The second round of axial coding surfaced a variety of assumed values including compliance, connectedness, comprehensibility, and complexity. Additional memoing on the value-based axial codes surfaced a variety of assumptions that stakeholders have about the audience for particular outcomes, the type of decision making that

[2]This included forms like applications for housing programs, and intake forms for collecting information from clients at the start of a program. These forms were originally Microsoft Office documents, PDFs, or electronic database entry screens.

data supports, and the extent to which data can render a context knowable. Our subsequent memos surfaced that these assumptions fall into two different perspectives: sociocentric and egocentric.

5 OUTCOME METRIC PERSPECTIVES

Workshop participants discussed their approaches to data analysis, which included approaches focused on holistic community-level impact as well as approaches that were more focused on individual, beneficiary-level impact. In what follows, we draw from the language of social network analysis to frame their approaches. As discussed by Marsden [25], social network analysis often examines data from two perspectives: sociocentric and egocentric. The sociocentric perspective focuses on understanding the complete network in its entirety by providing "information on relationships among all nodes within a bounded social network" [25]. On the other hand, the egocentric perspective focuses on "information about only that portion of a network in the immediate locality of a given node" [25].

While sociocentric or egocentric were not terms used by participants, we observed that workshop participants discussed decision making across networked levels of stakeholders that closely aligned with these perspectives. Outcomes discussed by participants that embrace the sociocentric perspective rely upon standardized and abstract representations to understand community-level impact. In effect, the sociocentric perspective is relied upon by outsiders (e.g., funders and the general public) to gaze upon the local context from a distance. On the other hand, outcomes from the egocentric perspective focus on understanding impact on individual community members. While the specific individual experiences are not visible from the sociocentric perspective, participants explained that those experiences are deeply embedded and essential to understanding the context of the egocentric perspective. These two perspectives are discussed further below.

5.1 Sociocentric Perspective

Many workshop participants discussed the need to collect data to assess outcomes from a sociocentric perspective, for example, across organizations at the level of cities and counties. To understand community-level impact, questions that participants ask from this perspective include:

- How many people are homeless in our community and is the number decreasing over time? The annual point-in-time count answers this by conducting a census of people experiencing homelessness on a single night in January.
- Is our system as a whole addressing the needs of people experiencing homelessness by getting them successfully housed? Success is determined by tracking the locations that people move to (e.g., overnight emergency shelter or long-term program) when they leave, or 'exit', a housing program. A positive 'exit' destination might be, for example, living with a relative, while a negative 'exit' destination would be living on the street.

In the United States, both the point-in-time count and exit destination metrics are defined by HUD, a federal agency. Participants from a funding organization in workshop one explained that outcomes like the exit destinations are examined at a system level through a "racial and equity" lens by sub-grouping these outcome metrics into relevant community demographics.

While the sociocentric perspective generates data that can be used to assess outcomes at a community level, as a staff member in workshop two explains, this is not the entire story:

> "We're exiting people, and maybe it's coming up as a negative exit or a positive exit on the report, but it's not showing the context, the facts of what's happening on the date of exit. It seems black and white, but as we know people are not black and white. There's more things happening that 'exited to destination' doesn't account for."

Table 2. Key Assumptions

	Sociocentric Perspective	Egocentric Perspective
Audience	Federally mandated counts and scores can convince funders and the public of the need to continue addressing homelessness because of the scale of the problem.	The individual experiences people face should be used to convince funders and the public of the need, and the complexity, of addressing homelessness.
Decision Making	Integrating different data sources should allow for quantitative metrics that support decisions that are aligned with the wise use of limited financial resources.	Rich qualitative data about individuals should be used to make day-to-day operational decisions.
Knowability	The quantitative metrics discussed above constitute hard facts because the important aspects of homelessness are fully knowable.	Taken out of context, an individual person experiencing homelessness will only ever be partially knowable.

The contextual elements that are missing include considerations such as an individual's priorities when dealing with other things happening in their life such as relationships, mental health challenges, substance use, and employment opportunities. Analytically, this information is more of a consideration from the egocentric perspective, which is discussed next.

5.2 Egocentric Perspective

Workshop participants also discussed the need to collect data to assess outcomes from an egocentric perspective, for example, rich narratives about the challenges that an individual experiences while living on the street. In order to understand impact on individual community members, questions from this perspective include:

- How has this person balanced their need to meet with case managers during the day to be eligible for services while also searching for employment?
- What communities is this person part of and how does that influence their ability to search for or stay housed?

In contrast to data collected for sociocentric questions, which rely on more precisely defined and typically quantitative metrics, the data used to answer egocentric questions requires collecting qualitative data. Participants referred to this as 'soft' information and 'anecdotal data' (W3), emphasizing that the data was not as trusted or valued by certain stakeholders.

Data used to address egocentric questions are not typically defined by an agency like HUD in any kind of consistent schema. For example, these data are not collected as part of the annual point-in-time count or on forms that ask about exit destination. A client in workshop four explained that these data are best collected by "actually sitting down and talking to [people experiencing homelessness] to see what's going on in their lives and how they can help." This type of data is not "track[ed] in logs necessarily" but is instead gathered through conversations with people experiencing homelessness, and is shared throughout the organization as a "network of information" is formed through conversations among staff and clients (W3).

6 OUTCOME ASSUMPTIONS

Workshop participants surfaced a variety of different assumptions that were analytically placed within their corresponding sociocentric or egocentric perspective. These assumptions (summarized in Table 2) were about what audiences the data speaks to, what the data conveys to those audiences, the ways that audiences should use data to make decisions, and the ability for audiences to know and understand details about the context being assessed. Overall, participants assume that outcomes from the sociocentric perspective must emphasize quantitative metrics—particularly in economic terms—that can render homelessness understandable to outsiders such as funders and the general public. Outcomes from the egocentric perspective instead assume that—while not fully representative—individuals' experiences can be used to better understand homelessness and support day-to-day decision making.

Before we discuss the specifics of these assumptions, we must provide two clarifying points. First, the designation of an assumption as either sociocentric or egocentric is not meant to indicate the physical location of decision making (i.e., sociocentric questions are not only asked by federal law makers in government buildings, and egocentric questions are not only asked by individuals experiencing homelessness on the street). Rather, an assumption's classification here as either sociocentric or egocentric refers instead to the approach an individual stakeholder takes to data analysis. For example, people experiencing homelessness made both egocentric assumptions about how to find food pantries that were open, as well as sociocentric assumptions about how homelessness is understood by the public. These empirical nuances are consistent with other HCI research findings in the context of homelessness [21, 23].

Second, we rely on the term 'assumption' to convey several important analytic points about our observations. In presenting what workshop participants discussed, we make no assertions here as to the validity of their assumptions, but instead present them as described to illustrate how they complement or conflict with one another. We also use this term to indicate that workshop participant's beliefs are likely fluid. While these assumptions may be true today, they may change in the future as sociotechnical dynamics evolve.

6.1 Audience Assumptions

Workshop participants discussed assumptions they make about the audiences for outcome metrics. Outcomes from the sociocentric perspective focus on numbers of people experiencing homelessness, whereas the egocentric perspective emphasizes rich narratives about the challenges that an individual experiences while living on the street. Both of these forms of data are used to convince funders and the general public of the need to continue addressing homelessness, however, each perspective has a different approach. The sociocentric perspective emphasizes the scale of the problem, while the egocentric perspective captures important nuance as well as the emotional gravity of experiencing homelessness by connecting more deeply with the individual person.

6.1.1 Sociocentric Perspective's Audience Assumptions. Using metrics often defined by HUD, sociocentric perspective outcomes regarding audience assume that *federally mandated counts and scores can convince funders and the public of the need to continue addressing homelessness due to the scale of the problem.* Participants from workshop one, which included staff members at the region's coordinating agency that distributes HUD funding, explained that their work is focused on (a) getting the data that are federally required, and (b) ensuring that they are high-quality data. Participants in workshop three confirmed that the region's coordinating agency is all about: "help us process the data, help us collect the data, [and] help us quantify [homelessness]."

In response to criticism from a person experiencing homelessness who said that the questions asked during the HUD mandated point-in-time count do not tell the whole story, a staff member

in workshop four explained that is not the goal. "It's not about emotion, it's about facts. So that's why they do it that way. They have to have facts to take back, because that's what stats are about, taking back factual information about things that are happening." A client from the same workshop further explained that one of the realities is that "statistics move the kitty. They fund the kitty and we gotta have those to justify that money being allocated. I know it seems impersonal but it's a reality."

All workshop participants emphasized that using data to communicate the need to address homelessness to the public was important. Clients in workshop five explained that as the count of people experiencing homelessness was increasing, they have seen that "homelessness is getting a higher profile across the country." In some cases, as a case manager in workshop two explained, many community members need to be convinced that homelessness is even a problem in their community. This tends to be more of a problem in rural areas where people experiencing homelessness are less visible.

6.1.2 Egocentric Perspective's Audience Assumptions. Egocentric perspective outcomes regarding audience assume that *the individual experiences people face should be used to convince funders and the public of the need, and the complexity, of addressing homelessness.* While it is important to quantify homelessness and "collect what [funders and the public] need to further fund what happens in [homelessness] programs" (W4), these quantitative metrics are missing quite a bit of context. As a staff member in workshop four explains, "it's one thing to count people, it's another thing to...measure someone's experience. We do a lot of trying." Within the organization's job training program, the number of people who have obtained a job by the end of the program is tracked in a database. However, as another staff member explains,

> "It's not just about the employment, it's also all of the factors. It is: do I have housing? Where I can lay my head down and get a proper night's rest, be clean, and go to work in clothing that's been laundered... That I have transportation or live close enough to my job that I can get there on time and keep my employment. So there are a lot of factors. It's not just about getting a job...There are so many criteria that feed into job stability."

A count of people who have obtained a job through an organization's program tells the story from the sociocentric perspective, however, this metric is not able to convey the broader context that influences one's ability to maintain stable employment. This context is more embraced from the egocentric perspective by *seeing and hearing* people experiencing homelessness (W3,W4). This perspective has the potential to educate the public and funders to get them on board with reallocating money to more seriously address homelessness.

In the program that participants in workshop three run, volunteers 'see and hear' people experiencing homelessness, which is something they often do not get elsewhere in society. When people are seen and heard on an individual level, the narrative can shift from one of people being lazy and a strain on society to one in which they have been let down and ignored by society (W3,W5). Data from the egocentric perspective conveys individuals' stories to funders and the public so that they can better understand the need to address the complex problems that are faced by people experiencing homelessness.

6.1.3 Sociocentric/Egocentric Perspective Trade-offs. Even from different perspectives, there is a shared goal of convincing the public and funders of the importance of addressing homelessness, however, there is disagreement about the role of each perspective in terms of what information can be conveyed to the audience.

Statistical data privileged by the sociocentric perspective are viewed as important by funders, staff, and clients to convey the scale—and therefore importance—of the problem. However, workshop participants believe that a focus on these numbers is at the expense of both the emotions and individual nuance that is needed to understand and appropriately respond to the problem. As a result, incorrect narratives about people who are experiencing homelessness are pervasive, and people are not seen or heard.

Qualitative details privileged by the egocentric perspective are important to many stakeholders, however, multiple workshop participants discussed the need to map these so-called intangible experiences onto a 1-10 scale (W2,W3,W4). The focus on turning qualitative experiences into quantitative metrics stems from two motivations: (1) the belief that sociocentric (statistical) data are more powerful, and (2) the limited ability to aggregate and scale up so-called intangible experiences so that they can be understood at the sociocentric level.

In summary, both the sociocentric and egocentric perspectives lack important information—the sociocentric perspective lacks emotion and nuance, and the egocentric perspective lacks scale. What each perspective lacks is one of the main strengths of the other perspective.

6.2 Decision Making Assumptions

One of the goals of outcome assessment is to gather data that can support decisions about how programs might be modified to achieve desired results. In the area of homelessness, the desired result is simply to end homelessness, and outcome assessment can help provide insight on how to modify programs to realize that end. From the sociocentric perspective, better programs can be designed by integrating data systems across the community to better understand how to use limited financial resources to more optimally provision services in the future. Whereas, from the egocentric perspective, better programs can be designed by focusing more on the emotions and experiences of individuals experiencing homelessness in the here and now.

6.2.1 Sociocentric Perspective's Decision Making Assumptions. When approaching decision making from a sociocentric perspective, participants assumed that *integrating different data sources should allow for quantitative metrics that support decisions that are aligned with the wise use of limited financial resources.* Ideally, these decisions would be made by compiling data across community organizations such as homelessness service providers, the criminal justice system, foster care providers, and healthcare organizations. By building a "bridge between those [information] systems" (W1) homelessness can be quantified as: cost per person experiencing homelessness. This would allow for critical analysis as described below.

> "We can talk about what the average cost of living is for a person in [the city] for a year...But what does it cost the city, or the agencies, to have someone experiencing homelessness for that year? You're incarcerating all these people all the time because of the crime of not having a home. How much does it cost to find them a home? How much are we spending on police resources to sweep everyone versus putting that money into making affordable housing? We fine these people because they don't have a home, and then you take them to jail and spend so much money housing people in jail when they could have just been housed and never got a ticket in the first place." (W1)

As discussed in other CSCW research [19], access to homelessness programs is governed through the use of the VISPDAT (Vulnerability Index Service Prioritization Decision Assistant Tool), a standardized form that asks an individual to explain their history of homelessness including interactions with emergency rooms and law enforcement. The form has the person experiencing homelessness answer a variety of yes/no questions that are then translated into numeric scores

which are entered into a database. Based on that final number, a decision is made regarding the individual's eligibility for services. As a client in workshop five explained, "I did the VISPDAT form and I didn't mind doing that. That's how I actually got my housing here...because I had high numbers." The quantitative output from this tool acts as a proxy for estimating how much this one individual is costing taxpayers based on their interactions with expensive public services like jail and healthcare. In quantifying this person's cost to society, decisions can be made that optimize limited financial resources.

6.2.2 Egocentric Perspective's Decision Making Assumptions. Egocentric decision making assumes that *rich qualitative data about individuals should be used to make day-to-day operational decisions.* Cost-effectiveness and "using our resources wisely" (W4) was a concern of many workshop participants, including staff and people experiencing homelessness. However, many workshop participants were also concerned about decisions made based only on anticipated cost. For example, one person who formerly experienced homelessness said that he "got lucky that the cops in that town accused me of shoplifting" (W5) because it resulted in him getting a higher VISPDAT score. Another person currently experiencing homelessness expressed frustration that someone he knew who came out of jail was handed keys to a "free apartment for life," because his VISPDAT score was higher, while he—a person who has been living on the streets for eight years and not getting into trouble with the police—could not get housing assistance because his score was too low. Without rich qualitative data to inform the decision of who to provide housing, the VISPDAT numeric score creates a system that is viewed as unfair by many stakeholders.

In acknowledging the emotions and experiences of individuals experiencing homelessness, the focus shifts from making decisions that have implications further out in the future to focus more on decisions that are relevant today. The kinds of decisions about program quality and effectiveness are manifested in questions that focus on the individual client's most recent experience and include: "Did they get a good night's sleep? Did they leave feeling renewed physically, mentally, and emotionally to face another day on the streets?" (W3). While it may be possible to ask clients to provide quantitative scores to answer such questions, the volunteers in this workshop stressed that the conversations they have with people who stay in the shelter are much more rich and actionable if not answered numerically. In fact, one participant said that "the information we get now is so good, that I don't know what the point of getting this on a [numeric] scale would be." Similarly, a mental health professional in workshop two focused on having conversations with the people she meets with to understand their mental state holistically to deliver customized treatment plans.

Consistent with other HCI research [21], we found that people experiencing homelessness also use qualitative data to make day-to-day operational decisions, particularly about where and when to enroll in programs that provide things like housing, food assistance, and clothing (W4). A client in workshop five also explained that his assessment of the program he was enrolled in was carried out in a way that prioritizes relationships between individuals and the day-to-day interactions he has with those individuals. For example, he said that staff in his program get an "A+ for effort" because they are supportive when people need things like rides to the doctor or even to the comic book shop.

6.2.3 Sociocentric/Egocentric Perspective Tradeoffs. Both the sociocentric and egocentric perspectives use data to make decisions about how to improve homelessness services, however, they differ in the level at which they aim to optimize program improvements. The sociocentric perspective makes decisions to improve fairness across the community—a community that includes taxpayers—by integrating data sources to prioritize a cost-based decision strategy. In taking this approach, however, important details about the individual's experience are neglected, and cost-based approaches that are perhaps unfair to the individual are adopted.

The egocentric perspective makes decisions to address fairness for the individual by embracing exactly those experiences that are elided from the sociocentric perspective. However, egocentric decision making does not incorporate the broader sociocentric perspective. For example, addressing how a person slept last night is important for assessing program effectiveness, but does nothing to address the need to obtain access to longer-term housing. In focusing on today's issues and experiences, there is a lack of focus on the work needed tomorrow.

These assumptions, therefore, surface the need to pay attention to fairness at both the sociocentric and egocentric levels. Fairness at the sociocentric level focuses on the equitable distribution of funding as a whole, and fairness at the egocentric level focuses on honoring individual's stories in relation to the network as a whole.

6.3 Knowability Assumptions

Workshop participants discussed assumptions they make about their ability to fully grasp the complexities of homelessness through outcome metrics. As discussed in the literature review, the outcomes of public and nonprofit programs are often very subjective and difficult to evaluate. Through consistent quantitative data collection, sociocentric perspective outcomes are assumed to have the capacity to achieve high levels of legibility and full population coverage of people experiencing homelessness. Egocentric outcomes, on the other hand, emphasize that the person experiencing homelessness will never be knowable due to a hyper-focus on the individual person. Participants explained that this focus neglects connected elements of a person's life like their social network, other needs beyond housing, and broader social phenomena that are not directly under the individual's control.

6.3.1 Sociocentric Perspective's Knowability Assumptions. So far we have discussed that from the sociocentric perspective, it is assumed that the importance of addressing homelessness can be conveyed through standardized and high-quality quantitative metrics such as cost/person experiencing homelessness. Participants believed that public support can not only be bolstered, but more focused by demonstrating that addressing the root cause of homelessness will ultimately save taxpayer money. While the first two stakeholder assumptions can make a compelling case that homelessness should be addressed, such an argument relies on the availability of so-called hard facts. Therefore, the third sociocentric perspective's assumption is that *the quantitative metrics discussed above constitute hard facts because the important aspects of homelessness are fully knowable.*

It is assumed that by using federally-mandated data specifications to collect data from almost every person experiencing homelessness, facts are more knowable. Consistent collection of information about people experiencing homelessness using agreed-upon data specifications is made possible through the use of the Homeless Management Information System (HMIS), a database used to track individuals' interactions with homelessness programs (W2). Workshop one participants are tasked with overseeing this database and explain that:

> "Everything that we do [and] everything we track is through the prism of how the federal partners instruct us...We have agencies and programs that don't receive federal funding that are using our [HMIS] because we want [as much of] an all-encompassing look at homelessness as we can have. But in terms of outcomes, we're going to be in alignment with those federal buckets all the time."

While this organization may in some cases incorporate "some additional fields" (W1) into its data schema, the system and the database enforce the consistency that is needed to draw conclusions at the city, county, and state levels. Consistency of data specifications allow stakeholders to be able to "look at data from across the country" and ask questions like "What are other people doing and

what works?" (W3). One participant in workshop one also explained that these data can be used to "build out dashboards" to reflect data back to the community from which it was collected.

As mentioned in the quote above, even non-federally funded organizations are encouraged to enter data in HMIS to get "an all-encompassing look at homelessness" (W1). The need for an all-encompassing look is explained by a participant in workshop three:

> "I think there's so many myths around homelessness. All we know about homelessness is the person on the corner that's asking for money, and that's just a small slice of homelessness. There are more children that are homeless than we ever think, but they're sleeping in cars, they're sleeping on couches. That's considered homeless, it's not sustainable housing, it's not an adequate place to live. Getting those facts/data around who's homeless and what kind of homeless are they, I think is important."

By reaching out and making contact with children experiencing homelessness to collect their data, participants believed that a more complete and compelling set of facts can be compiled and communicated to the public and funders. Every workshop discussed the variety of misconceptions the public has about people experiencing homelessness and believed that through better sociocentric perspective data, these misconceptions could be corrected to increase public support for funding homelessness services and to provide more affordable housing in the future.

6.3.2 Egocentric Perspective's Knowability Assumptions. So far we have discussed that from the egocentric perspective, it is assumed that the importance of addressing homelessness can be conveyed through narratives that see and hear individuals experiencing homelessness and the nuance of the challenges they experience. Participants explained that these data are best used to support day-to-day operational decision-making due to their emphasis on relationships among people. While these data are useful and reliable, particularly for convincing the public and making day-to-day decisions, the third assumption is that *taken out of context, an individual person experiencing homelessness will only ever be partially knowable.*

According to workshop participants, characterizing the experience of homelessness based solely on the individual unit of analysis misses essential data about the social network an individual relies upon for resources (W2). Attempts to quantify and predict an individual's cost-to-society using a tool like the VISPDAT—which also operates from the egocentric perspective by setting its gaze upon the individual person—does not take into consideration the complexity of that person's relationships with others in the community. As a volunteer in workshop three argued, the individual can only ever be partially knowable when their associated community is not taken into consideration:

> "When the VISPDAT prioritizes people for going into units, it's hard to create community among the residents. They're being taken out of their community on the street and being put into a new context that's uncomfortable. What should be done instead is take people who are vulnerable that are already in communities and move them into buildings...We call people homeless or say they're experiencing homelessness, but actually they're house-less. They have a home on the street, and we're breaking up their homes to put them in a house."

In other words, when focusing on data solely about the individual, the person is only ever partially understood because the very nature of a human being is to be socially connected. Workshop participants also explained that individuals are assessed as isolated units that are further partitioned out into particular needs such as housing, food, and medical care. As discussed earlier, data about an individual is collected across community organizations such as homelessness service providers, the criminal justice system, foster care providers, and healthcare organizations. However, participants believed that this compartmentalization of needs leads to hyper-focused views of the individual.

Looking at the quote again from a staff member in workshop four, we can see how an employment program must focus more broadly than just on employment-related aspects of the individual:

> "It's not just about the employment, it's also all of the factors. It is: do I have housing? Where I can lay my head down and get a proper night's rest, be clean, and go to work in clothing that's been laundered... That I have transportation or live close enough to my job that I can get there on time and keep my employment."

Lastly, examining a person experiencing homelessness out of context also misses out on broader social dynamics such as changes in public policy. A volunteer in workshop three describes the relationship between the decision to defund mental health services and people experiencing homelessness:

> "We know that one of the reasons, probably one of the *major reasons*, that people are on the streets is because in the 80's they closed down all the mental health places to help our people. We don't need to collect [any data], we know that."

In the three ways discussed above—social networks, diverse needs, and broader social dynamics—we can see that a focus purely on the individual results in an assumption that the person will only ever be partially knowable. When approached purely from the egocentric perspective, data is always incomplete.

6.3.3 Sociocentric/Egocentric Perspective Trade-offs. Both the sociocentric and egocentric perspectives aim to understand homelessness to appropriately address the problem, however, they disagree on the extent to which homelessness and people experiencing homelessness are knowable. The sociocentric perspective assumes that homelessness is fully knowable, while the egocentric perspective assumes that the person experiencing homelessness can only ever be partially knowable.

While metrics that are aligned with the sociocentric perspective (e.g., complete counts of individuals experiencing homelessness) are possible to measure, the visions of full population coverage have simply not yet been realized according to participants. Measurement challenges like reaching people who are sleeping on couches and a lack of consistently implemented data definitions would seem to imply that sociocentric outcomes will, in fact, always be partially unknowable. However, this is not in line with what participants believe. Therefore, it would suggest that the egocentric perspective's inability to more fully understand an individual can be supplemented by the sociocentric perspective's stronger grasp of knowability. This involves viewing the individual as a network of relationships with other people, as a connected whole with diverse needs, and as a single person situated within a long human history.

These assumptions surface the need to embrace both the sociocentric perspective's attempts to achieve full population coverage and legibility (or complete understanding) of homelessness alongside the egocentric perspective's focus on the individual to bridge the limitations of each perspective. Together, partial knowability can be achieved and decisions can be made that challenge existing misconceptions to equitably address homelessness.

7 DISCUSSION

In quantifying homelessness using data specifications set by the federal government, metrics such as the number of people who are experiencing homelessness or the number of people who have obtained employment conveys certainty and clarity to the public. By focusing on a measurement that everyone understands—namely dollars and cents in the VISPDAT case—the problem of homelessness becomes more comprehensible to the general public. In such a financially efficient system, decisions are logical and informed by facts that are derived from data that feels reliable and consistent. Overall, this perspective convinces funders and the public that they are seeing the whole picture,

yet does not encourage them to dig deeper to obtain a more accurate picture from working with or experiencing homelessness.

Our analysis indicates that the focus on sociocentric metrics that supposedly have the capacity to convey a complete picture of homelessness is best imagined as a panopticon. The panopticon allows for a high-level view that makes complex human phenomena such as homelessness legible to outsiders (see Figure 1a). While some might argue that the panopticon is sufficient for funders and the public to be invested in addressing homelessness, others have disagreed, saying instead that this emotionless perspective is not convincing. Many stakeholders have also argued that this panopticonic approach is insufficient for making day-to-day management decisions. Despite these limitations, currently deployed systems/tools like the HMIS and VISPDAT predominantly embrace the panopticonic orientation.

In this discussion, we will argue that the panopticonic orientation of current systems should be replaced with an oligopticon orientation (see Figure 1b). In doing so, systems like the HMIS can better address diverse community member needs. Immediately after the conclusion of these workshops, it was announced that the VISPDAT would be discontinued for precisely these concerns. While a replacement tool has not yet been adopted, we would argue that the new data collection tool should embrace an oligopticon orientation.

While the panopticon and oligopticon concepts were not explicitly used by research participants, we believe that they are indeed two productive theoretical orientations that help us understand the needs of these users. By analytically placing these two orientations up against one another, we can begin to understand if it would be possible to shift away from information systems that exhibit characteristics of a panopticon. Since prior HCI and CSCW research has shown that the panopticon is not only a common orientation in modern information systems, but also a very troubling one, we offer the oligopticon as an alternative to the panopticon. Such an alternative orientation may also be useful in other domains besides homelessness—where decisions are made across multiple stakeholder groups that lack consensus—such as government, healthcare, or education.

7.1 Understanding Homelessness through a Panorama

From the sociocentric perspective, as seen in both Figures 1a and 1b, the people who stand in the tower high above the world operate on the assumption that their view is comprehensive and certain. The ups and downs of homelessness have been thoughtfully summarized, ordered, and distilled down to metrics like total cost per person. Once the micro, meso, and macro have been appropriately nested into these metrics, standardized forms can be used to determine how to prioritize individuals for services. From this perspective, homelessness can be fully knowable as a panorama. The sociocentric perspective shares the sense of closure—or completeness that suggest further questioning is unnecessary—that is espoused by the panorama. For example, when a 'whole situation' is examined in a newspaper, readers get the sense that while there may be further detail that could be known, they now have a complete overview of the most important details to understand the substance of the situation.

There are several hurdles to jump through when viewing homelessness as a panorama. From the tower, observers (like funders) do not know that the way they are interpreting behavior on the street is inconsistent with what individuals experiencing homelessness are actually doing on a day-to-day basis. For example, from the tower an employment program for people experiencing homelessness can be understood more simply as a binary representation: the person either got a job, or they did not. However, this oversimplified representation is much more complicated and nuanced when you leave the tower and look at things from the view of the person on the street.

Staff and clients in workshops three and four did not consider conversations and stories to even be considered data unless it was converted into a numeric score that could be aggregated in

spreadsheets: "If it's not in a spreadsheet, it's not data. If it's not numbers, it's not data." Workshop participants equated "data-driven" with "numbers-driven" and hypothesized that perhaps people who are numbers/data-driven "don't connect with people that are anecdotal-driven." In this scenario, stakeholders are attempting to translate the street-level experience to the tower in terms that it understands: numbers. These numbers can convey questions of the scale of homelessness, but the emotions and individual nuance that exist within the so-called 'anecdotes' are difficult to see from the tower.

While workshop participants reported considerable success in using egocentric perspective data to make day-to-day operational decisions, they expressed frustration when it came to transferring the insight gained from this perspective to those with the power (e.g., government officials) to change the system. People experiencing homelessness in workshop four explained that people have to choose between which shelter to stay at based on how well staff treats residents and the cleanliness of the facility. Because there is not a "Yelp for shelters" (W4), people share information among one another about the living conditions of each facility. In some cases, shelters may have bed bug infestations or may be staffed by individuals who are verbally or physically abusive towards residents. Despite the importance of this information that allows people experiencing homelessness to make good day-to-day decisions, workshop participants explained there is no way for this information to be shared with those in charge, nor is there an incentive to correct these issues. When the panopticon is focused on minimizing the cost to taxpayers, improving shelter living conditions is not a priority, and this data is not transferred up into the tower to decision-makers.

While the panopticonic prison would never allow for this, if we imagine for a moment that it were possible to leave the tower and talk to the person living on the street, our perspective would shift from that of the network to that of the individual node. In Verma and Voida [34], this might be considered "drilling down" from the aggregate quantitative data to access the individual qualitative data to understand the "human element." While we might obtain additional information about that person's lived experience, as we have seen, the egocentric perspective also has its own unique set of limitations—such as a lack of trust, and difficulty in representing complex experiences in a scalable way. Understanding homelessness, therefore, is difficult from any given single perspective. To better understand homelessness, we argue that *both perspectives* must be relied upon in concert with one another, as illustrated in Figure 1b.

7.2 Understanding Homelessness through an Oligopticon

Given the limitations of the panopticon, we will now imagine the possibility of understanding homelessness instead as an oligopticon [20]. What the oligopticon suggests for understanding homelessness is that we treat the sociocentric perspective as holding *equal* value as the variety of egocentric perspectives. Instead of the sociocentric and egocentric perspectives being put up against one another in a fight for dominance, the oligopticon makes it clear that both perspectives provide value equally (see Figure 1b). Taken together these perspectives can help us work across groups of stakeholders to understand homelessness (as well as a variety of other difficult-to-measure contexts) more holistically.

7.2.1 Navigating Between Sites. Analytically, we can treat this multitude of sites equally by recognizing the "flows of information leading from or to the outside" of the center of calculation (guard tower) [20]. For example, in seeking to understand the employment situation of people experiencing homelessness, we can view the center of calculation metric of 'percent employed' as having a variety of connections to outside sites such as places of employment, individual's homes, and bus stations. From an oligopticonic perspective, as illustrated in Figure 1b, the center of calculation's (sociocentric) perspective becomes one site of many other egocentric sites to visit.

The metrics that the center of calculation is concerned with are perhaps unsurprisingly largely quantitative. All stakeholders, including people experiencing homelessness, indicate that keeping track of funding and other quantitative metrics is both valuable and necessary. Therefore, a new information system cannot simply replace quantitative metrics with qualitative ones — or more accurately replace the sociocentric perspective with the egocentric. Under an oligopticonic system, it is possible to embrace both types of metrics and both perspectives simultaneously, recognizing that each contributes a unique and important point of view. Resource/funding allocation decisions that previously may have been made based on largely quantitative data were viewed as unfair by participants. The embrace of more data (quantitative, qualitative, sociocentric, and egocentric) may allow such resource allocation decisions to be more fair in the future.

7.2.2 A Connected Individual. In taking an oligopticonic approach, we can embrace the individual as well as their connections to people in the community. The individual experiencing homelessness can be understood as a connected whole, consisting of diverse needs that cannot fit neatly into single categories of employment or housing but are instead a set of needs that transcend categories. A visualization system could use a magnifying glass to zoom into more details about an individual's lived experiences such as their friendships with one another, as well as their thoughts and emotions. As such, we can understand one person's life in relation to a set of experiences across the community to wrestle with the idea that cost savings for the system may come at the price of treating individuals unfairly. The oligopticon allows us to circulate within and across this array of sites to see "sturdy but extremely narrow views of the (connected) whole" [20].

When zoomed in on the egocentric perspective, the interface could present data such as quotes from the individual or even audio/visual recordings of the individual describing their experiences. Our current information systems might visualize these data in a typical user account profile view—perhaps including a photo, an open-ended bio paragraph, and some demographic details. Even with the incorporation of audio/visual recordings into the traditional user profile, this format is woefully lacking in its ability to represent the richness of a human being. Therefore, egocentric data views are the biggest innovation opportunity for HCI and CSCW if we are to implement information systems that are more aligned with oligopticons in the future.

7.2.3 Resisting Closure. The transition from a panopticon to an oligopticon does raise questions regarding knowability. In bringing together the sociocentric perspective's belief that homelessness is completely knowable with the egocentric's perspective of only partial knowability, there is a question as to where the oligopticon leaves us. Importantly, can we ever rely on these data to be useful for decision making? One participant in workshop two said that it says a lot about a decision-maker when they're willing to ask questions. Asking questions rather than stating facts suggests that there is an openness to engage in dialog about uncertainty. Perhaps there is some aspect of homelessness that the decision-maker is not aware of, or perhaps there is something missing from the data in front of them. Given the complexity of an issue like homelessness, the resistance of closure is perhaps more of a feature than a limitation of the oligopticon. In the oligopticon, information is useful for decision making as long as everyone involved acknowledges that there is always more to know.

7.2.4 Resisting Surveillance. While it might be appealing to suggest that surveillance should be rejected outright, such an assertion would be naive in that some level of surveillance will always be necessary for even reasonable levels of accountability. Rather than outright reject surveillance, CSCW researchers and designers must provide users with better control over what is seen by others. A feature of an oligopticon is that it is open to resistance by those who are subject to its surveillance. Since the oligopticon accepts that it will never see all, there is more flexibility and

potential for individuals to push back on what it can see. In applying the oligopticon to fishermen who were being monitored remotely, Gad and Lauritsen [14] observed that:

> "...the fishermen discovered that they were not dealing with an effective surveillance machine, but with a fragile oligopticon that can be bypassed and resisted. For example, fishermen sometimes cover the aerial [sensors on their boats] with metal buckets. They thereby block the signal, and become invisible to the inspectors."

Within this domain, it seems possible that individuals may not want their healthcare or criminal justice data to be assessed in the center of calculation by funders or government officials. By viewing this data ecosystem as an oligopticon, resistance to data collection on the grounds of privacy no longer is a problem that must be overcome by improving the gaze of the guard in the tower. Instead, people experiencing homelessness can find their own version of a metal bucket to cover up the sensor. One example, inspired by Bopp et al. [4], might involve giving a different name than their legal name when interacting with homelessness services that do not require legal ID so that their records cannot be connected to their legal names and fingerprints on file with the department of corrections.

7.3 Oligopticonic System Requirements

In contexts like this one where phenomena under examination are complex and nuanced, and the privacy of individuals should be respected, designing information systems to be more oligopticonic in nature would support better decisions and be more fair and equitable. While the oligopticon has been proposed and explored at a theoretical level by Latour [20], the specifics of an information system that adopts an oligopticonic approach have not yet been specified. We will now introduce more granular oligopticon requirements that are suggested from our research. On an operational level, an oligopticonic information system should support:

- Flexible addition of data specifications over time, including those that are perhaps inconsistent with existing data specifications;
- So-called gaps in data sets, where data might appear to be missing from various individuals in the population;
- More complete integration of unstructured data for individual's stories and experiences;
- Tools for deep analysis of large amounts of unstructured data;
- Relational connections between fields, individuals, and data sets along with fields for explaining connections.

More importantly, however, an oligopticonic information system must also support several shifts in thinking on the part of the user:

- Encouraging the user to navigate beyond the center of calculation to more egocentric sites, despite the possibly uncomfortable realization that sites may disagree with one another;
- An acknowledgement and embrace of the uncomfortable reality that all views are "sturdy", but naturally "extremely narrow" [20]—meaning that even the areas that are believed to be fully knowable by stakeholders are actually not fully knowable (sometimes for privacy reasons);
- Support for finding common ground between data-driven conclusions that at first seem to directly oppose one another.

7.4 Oligopticonic System Research

As described, a transition to an oligopticon requires that decision-makers and the public navigate to sites beyond the centers of calculation, thereby embracing uncertainty, and even incommensurate metrics. In essence, the oligopticon requires diverse stakeholders across the community to accept

that they must continually stay up to date with evolving, incomplete, and complex information. Designing collaborative information systems to meet such an array of needs is a formidable challenge to say the least.

This research has indicated that there is a need for oligopticonic information systems and has provided a basis for identifying preliminary requirements, however more research is needed. HCI and CSCW scholars should carry out additional research to prototype systems that may meet some or all of the oligopticonic information system requirements. Most importantly, in the spirit of the oligopticon itself, HCI and CSCW researchers must involve—or at the very least seek feedback from—diverse stakeholder groups throughout the design process.

8 CONCLUSION

Public and social sector organizations face significant challenges in understanding their impact. Their goals are often vague, and change is often difficult to see and measure. By focusing on the specific questions that stakeholders ask and the data points they use to answer those questions, this study has applied an alternative—and more inclusive—model for information systems in contexts rife with uncertainty and phenomena that are difficult to quantify.

More specifically, this research has made the following contributions:

- Facilitated cross-stakeholder workshops that detailed the types of questions about homelessness that particular stakeholders are concerned with;
- Identified and characterized two overarching perspectives that stakeholder questions fall into (sociocentric and egocentric);
- Explained the challenges that these assumptions introduce in terms of using data for decision making;
- Analyzed these data approaches both as a panopticon and as an oligopticon;
- Provided requirements for designing systems to support a more oligopticonic approach.

As information system designers, it is our responsibility to consider the ways that our systems prioritize services that impact people on such a deep level. When systems are driving decisions for marginalized and stigmatized populations, this becomes even more essential. Through systems that embrace the complexity of human life, we can work to change broader social and cultural narratives to better provide support for our fellow human beings.

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