

KI Workshop: Thought Piece

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1. What are the most urgent research questions to address about KI? Why?

The benefits of incorporating citizens into knowledge infrastructure (KI) to empower them in their daily lives have been well understood (Lin et al., 2016). Still, relatively little attention seems to be given to the development of more inclusive knowledge infrastructure by fostering opportunities for fair participation. User participation in the planning and designing of tools/systems to create sustainable infrastructure development has already been discussed (e.g., Edwards et al., 2013). Further, studies have also discussed the different user participation/contribution models in existing KIs, such as citizen science, community-based science, street science, and community research. However, the nature of that participation, the demands and abilities of marginalized populations, and methods to reflect inclusivity in design and/or operationalization of KIs for knowledge creation should be further investigated.

Many studies have already demonstrated how KIs can benefit and empower communities and citizens, especially when combined with numerous open data initiatives through existing knowledge and data infrastructures by providing access to new information and knowledge and teaching new technical skills (e.g., Corbett & Keller, 2005a, 2005b; Yoon et al., 2018; Yoon & Copeland, 2019). However, literatures have also pointed out how existing KIs did not help communities and citizens address their immediate community concerns and problems (e.g., Yoon et al., 2018). While KI should be mindful of diverse human needs, identifies, abilities and experiences, and forms of knowledge (Okune et al., 2018), existing KIs may not use non-expert citizens efficiently, and they may silence communities' abilities while not incorporating their needs.

This may be partially driven by the nature of citizens' and communities' existing participation in KIs, which takes a more "contributory" or "top-down" approach rather than a "co-created" or "bottom-up" approach. Although both approaches have their own distinctive values, the former usually permits less control for the participants; individuals contribute within the already established. However, the latter emphasizes shared decision-making and equal partnership. When citizens' participation is driven by the top-down or contributory approach, studies (particularly in the context of open data) have identified tensions and controversies around the engagement (e.g., Stuedahl et al., 2016; Yoon et al, 2018), questioning the extent of openness and deemed desire and trust (e.g., Stuedahl et al., 2016; Yoon & Copeland, accepted). Stuedahl et al. (2016) further argued that this tension limited the potential of new knowledge generation; the initiatives focus on providing access to existing data rather than acquiring new data.

Studies have also demonstrated that these citizens are never just unskilled laborers who pave the way for the real scientific work. Fricker (2007) discussed efforts to incorporate local knowledge to help resist epistemic injustice. Jalbert's (2016) study demonstrated how marginalized

stakeholder groups take part in shaping knowledge work and building knowledge infrastructures to address complex scientific and environmental issues. Further, while the formation of knowledge infrastructures may reproduce established power relationships, grassroots groups are also able to tactically alter power dynamics and redistribute resources to their advantage, which demonstrates the important potential roles of citizens and grassroots groups in KI development for community empowerment. Further, Lin et al. (2016) argued that citizens need to learn professional standards and develop new skills. However, translating that potential into the design of inclusive KIs is a complex and contingent process.

1. Identify a KI whose survival is under threat.
 - a. What led to these threats? Over what time frame?
 - b. What actions or changes in circumstances might lead to its survival?
 - c. What will be gained or lost, by whom, if this KI fails to survive?

With the emphasis on new data and new knowledge at scale, along with data aggregation into a large infrastructure, local memories, local knowledge, and local KIs have been under threat. These threats may be understood from two different angles: a risk to local heritage institutions and a loss of local memories/voices due to the tension that occurs when integrating local knowledge into bigger infrastructures. The former threat is obvious and notable, and it can lead a loss of important local heritage and history. For example, Murillo et al. (2018) discussed the oldest historic African-American church in the city of Indianapolis, Bethel AME Church, which played a vital role in the Underground Railroad, the founding of the first formal school for black children, and the development of the African Methodist Episcopal Church in the US. The historic church building was sold to a party who planned to make it a hotel; thus, both the historic church building and the extensive archive that spanned over 162 years was placed at risk.

The latter threat, the creation of data without meaning by not successfully incorporating local context and voices, is less visible, but still dangerous. Lin et al. (2016) argued this risk by explaining that individuals' local experiences and feelings tend to get lost or become invisible when user-contributed data are aggregated and integrated into a big data infrastructure—this can denote the loss of data provenance and the marginalization of individual efforts, motivations, and local politics, which might lead to disengaged participants and unsustainable citizen participation communities. Shavit and Silver (2016) also discussed the tension between locality and globalization through the attempts to provide interoperable infrastructure at scale, which may entail a loss of flexibility and local context.

Power dynamics surrounding KIs still impact the vulnerability of local KIs when resources become scarce and people struggle for legitimacy (Jalbert, 2016). Studies have shown that KIs are the core site of political action (Dagiral & Peerbaye, 2016; Jalbert, 2016). Stakeholders may request financial, political, and technical support from more powerful institutions, but Jalbert (2016) argued that KIs can become susceptible if strengthening alliances with institutions also means relinquishing control in deciding how KIs function. Further, without trust-building among those stakeholders, the nature of support and/or partnership remains questionable in marginalized communities (Yoon et al., 2018). However, if properly adopted in the infrastructures, citizens' participation through proper capacity building and resource mobilization will impact how power

dynamics retain control in the decision-making process and help empower citizens and communities.

2. How do KI spread information? Misinformation? Alone and in combination with other infrastructures?

Sparked by open data sharing and reuse, both data and infrastructures are often repurposed beyond their original intent. It is not difficult to find infrastructure repurposing examples. One example is when a database managed by a national laboratory is repurposed into a local laboratory-epidemiology communication tool (Boye, 2016). Local data intermediary organizations not only offer data interpretation services, they also perform basic data curation to develop their own data tools, which are also leveraged as communication tools between communities/citizens and data professionals (Yoon et al., 2018). There is a dynamic relationship among different infrastructures involved in repurposing activities (e.g., health care, public health, and the food sector in the context of the public health system), and interconnection among the multiple and heterogeneous infrastructures often implies broader social-political consequences (Boyce, 2016). Still, inequality exists in the process of re-purposing of data and infrastructure.

Regarding inclusiveness and the nature of participation involving the discussed KIs, marginalized communities have strong concerns about distortion or misinformation/misrepresentation perceptions when data and infrastructures are repurposed under particular political regimes (Yoon & Copeland, accepted). Thus, building relationships with other infrastructures to connect existing KIs and create synergy involves not just technical considerations, but also political and moral considerations. Dynamic relationships between different infrastructures and different social groups should be involved in aligning and repurposing data and infrastructure; it is important to have methods for discussing how actors enact and experience those relationships.

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